


City of Alexandria, Virginia

MEMORANDUM

MEMORANDUM TO INDUSTRY NO. 22-03

DATE: DECEMBER 30, 2021

TO: CONTRACTORS, DEVELOPERS, AND DESIGN PROFESSIONALS

FROM: YON LAMBERT, DIRECTOR, TRANSPORTATION AND ENVIRONMENTAL SERVICES (T&ES) 
Yon Lambert (Dec 30, 2021 15:15 EST)

SUBJECT: DRAINAGE AND SANITARY SEWER DESIGN & CONSTRUCTION STANDARDS UPDATE

T&ES has updated the Drainage and Sanitary Sewer details in the 1989 Design & Construction Standards to facilitate the design, review, and construction of conveyance systems, development, and capital projects. The standards have been updated and supersede any sanitary or drainage details in Memo to Industry: 01-11 Sanitary Sewer Lateral Connections and 02-09 Design Guidelines for Site Plan Preparation. The updated Design & Construction Standards also assist design consultants, contractors and City staff in the design, review, and construction of City sanitary and drainage infrastructure.

The changes include:

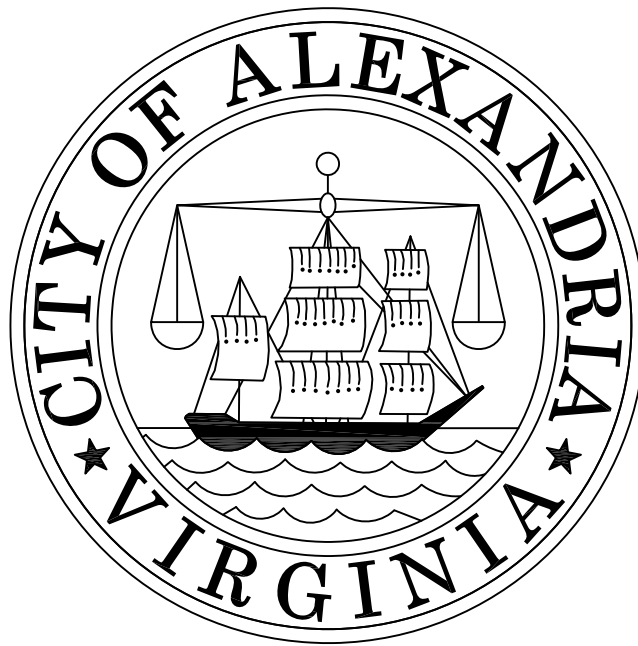
- Added a standard drop inlet detail.
- Added manhole shaping details for storm and sanitary sewers.
- Added one storm sewer and three sanitary sewer trench bedding details and notes.
- Added and updated the manhole & inlet reinforcement details.
- Added a doghouse manhole detail.
- Added sanitary sewer cleanout detail and notes.
- Added manhole grade rim adjustments and modified adjustment details.
- Added a manhole and pipe abandonment detail.
- Added a hydrant bollard detail
- Updates and corrections to the existing construction details and notes.

Capital Improvement plans and Preliminary (#1) development plans submitted after January 1, 2022, shall comply with the updated design standards. If you have any questions, please contact Lisa Jaatinen, Special Projects Manager at 703-746-4053 or lisa.jaatinen@alexandriava.gov.

Attachments: 2020 Drainage & Sanitary Sewer Design & Construction Standards

cc: Hillary Orr, Deputy Director, T&ES, Transportation
Lalit Sharma, Deputy Director, T&ES, DROW
William Skrabak, Deputy Director, T&ES, OEQ
Mark Gunderson, Division Chief, T&ES/PWS
Erin Bevis-Carver, Division Chief, T&ES/Sanitary
Jesse Maines, Division Chief, T&ES/Stormwater
Emilio Pundavela, Division Chief, T&ES/C&I
Brian Dofflemyer, Division Chief, T&ES/Development

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES



DESIGN AND CONSTRUCTION STANDARDS

2020

STANDARD NUMBER

TITLE

PAGE

SECTION 1 DRAINAGE

CSDI-1 & CSD1-1A	Curb Drop Inlet	1 – 4
CSDI-2 & CSDI-2A	Standard Drop Inlet	5 – 7
CSYI-1	Yard Inlet	8 – 9
CSMH-1 & CSMH-2	Precast Manhole	10 – 12
CSJB-1	Storm Sewer Junction Box	13
CSIS-1	Shaping Manhole and Inlet Inverts	14
CSFC-1	Yard & Curb Drop Inlet Frame & Cover	15
CSFC-2	Manhole Frame & Cover	16
CSJT-1	Bedding for Pipe & Trench Sections	17

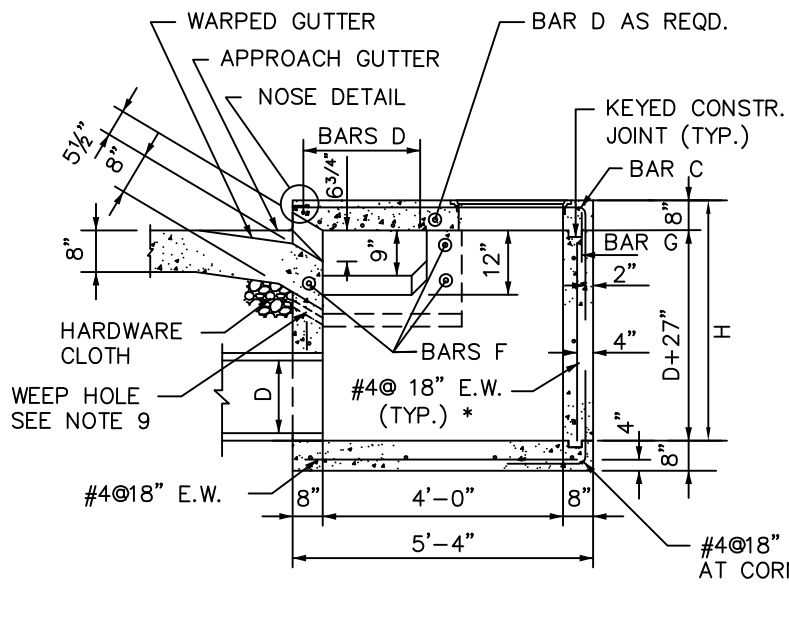
TABLE OF CONTENTS

01/16/2021

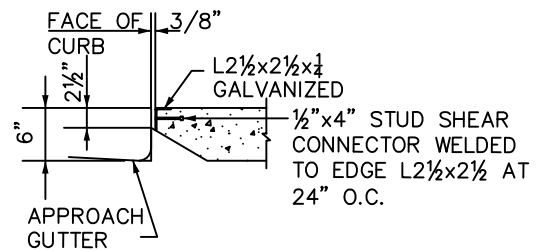
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ALEXANDRIA, VIRGINIA

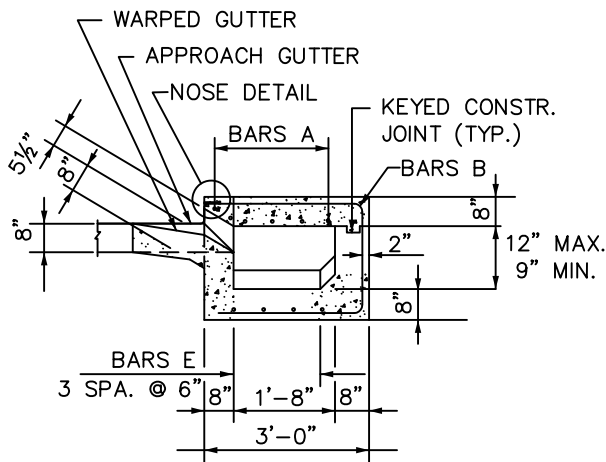
(1)



SECTION B-B



NOSE DETAIL



SECTION C-C

NOTES:
SEE PAGE 3 FOR GENERAL NOTES.

CURB DROP INLET

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ALEXANDRIA VIRGINIA

01/16/2021

REVISION DATE

CSDI-1 & CSDI-1A

PAGE 2

GENERAL NOTES:

1. DEPTH OF INLET (H) SHALL BE SHOWN ON PLANS. MINIMUM DEPTH (H)=4'-0"
MAXIMUM DEPTH (H)=8'-0".
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR IN ACCORDANCE WITH CSIS-1 TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE.
4. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
5. ALL REINFORCING BARS TO BE #5 OR AS SHOWN ON PLANS.
6. ALL REINFORCING STEEL SHALL HAVE A MINIMUM COVER OF 2" OR AS SHOWN ON PLANS.
7. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000PSI). PRECAST CONCRETE IS TO BE 4000PSI.
8. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
9. 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH $\frac{1}{4}$ " MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
10. LENGTH OF ANGLE IRON AS SHOWN ON PAGE 1 IS TO BE L+16".
11. INLET FRAME AND COVER SHALL MEET REQUIREMENTS FOR HS20 LOADING. (REFER TO FRAME AND COVER DETAIL (CSFC-1).)
12. JOINTS BETWEEN CONCRETE COVER AND GUTTERS (WHEN REQUIRED) ARE TO BE DOWELED, KEYED OR OTHER CITY APPROVED METHODS.
13. FOR RETROFIT PROJECTS:
 - A. CHECK WITH CITY INSPECTOR TO CONNECT NEXT CONCRETE C&G SECTION TO REQUIRED SAW CUT, PROPER JOINT MATERIAL ETC.
 - B. CURB OPENING SHALL NOT ENCROACH UPON CROSSWALK AREA.
 - C. PROVIDE NOTES FOR THE THICKNESS OF BEDDING AND TYPE ON SUBGRADE PRIOR TO INSTALLATION.
14. FOR BACKFILL DETAIL SEE BEDDING DETAIL (CSJT-1).
15. FOR CURB DROP INLET REINFORCEMENT SEE PAGE 4.

CURB DROP INLET

GENERAL NOTES

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA VIRGINIA

01/16/2021

REVISION DATE

CSDI-1 & CSDI-1A

PAGE 3

CURB DROP INLET REINFORCEMENT SCHEDULE

L	AREA OF SLOT	BARS A		BARS B		BARS C		BARS D		BARS E		BARS F		BARS G		WEIGHT
Ft.	Sq. Ft.	NO. of Bar	Lin. Ft.*	NO. of Bar	Lin. Ft.*	NO. of Bar	Lin. Ft.*	NO. of Bar	Lin. Ft.*	NO. of Bar	Lin. Ft.*	NO. of Bar	Lin. Ft.*	NO. of Bar	Lin. Ft.*	Lbs.
4'	1.83	5	1'-6"	2	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	1'-6"	3	1'-6"	4	1'-0"	64
6'	2.75	5	3'-6"	6	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	3'-6"	3	1'-6"	4	1'-0"	111
8'	3.67	5	5'-6"	10	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	5'-6"	3	1'-6"	4	1'-0"	158
10'	4.58	5	7'-6"	14	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	7'-6"	3	1'-6"	4	1'-0"	204
12'	5.50	5	9'-6"	18	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	9'-6"	3	1'-6"	4	1'-0"	251
14'	6.42	5	11'-6"	22	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	11'-6"	3	1'-6"	4	1'-0"	298
16'	7.33	5	13'-6"	26	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	13'-6"	3	1'-6"	4	1'-0"	345
18'	8.25	5	15'-6"	30	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	15'-6"	3	1'-6"	4	1'-0"	391
20'	9.17	5	17'-6"	34	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	17'-6"	3	1'-6"	4	1'-0"	438

* DENOTES LENGTH OF ONE (1) BAR.

CURB DROP INLET

REINFORCEMENT SCHEDULE

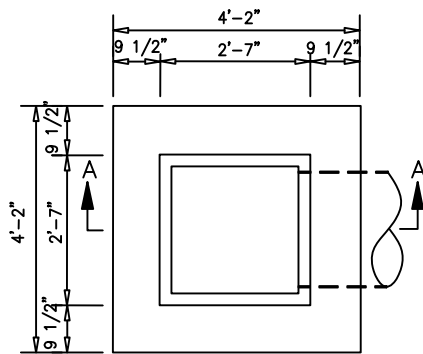
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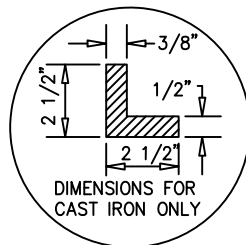
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CSDI-I & CSDI-IA

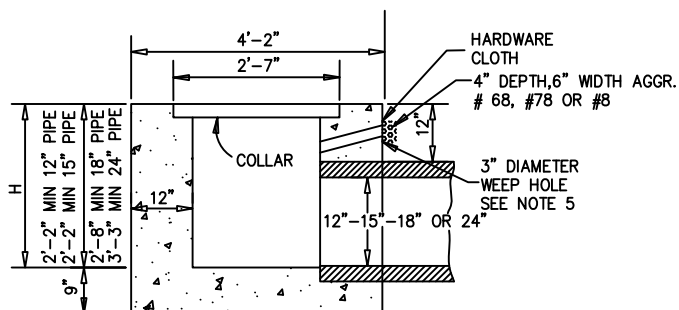
PAGE 4



PLAN
(GRATE REMOVED)



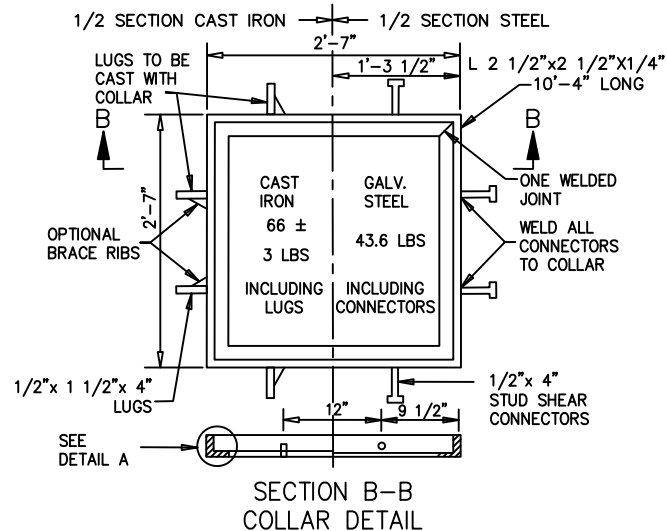
DETAIL A



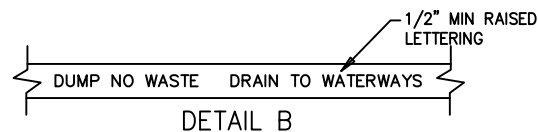
SECTION A-A

CONCRETE QUANTITIES FOR MIN. DEPTH

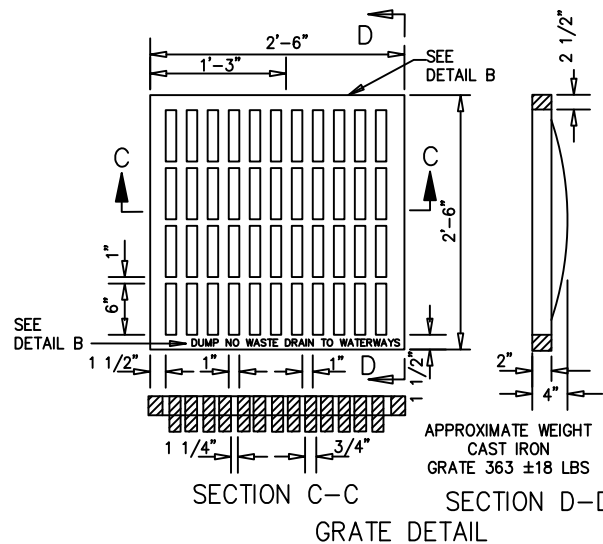
12" CONCRETE PIPE - 1.440 CU.YD. CONCRETE
 15" CONCRETE PIPE - 1.528 CU.YD. CONCRETE
 18" CONCRETE PIPE - 1.620 CU.YD. CONCRETE
 24" CONCRETE PIPE - 1.817 CU.YD. CONCRETE
 ADD 0.469 CU. YD. PER
 ADDITIONAL FOOT DEPTH.



SECTION B-B
COLLAR DETAIL



DETAIL B



SECTION C-C
SECTION D-D
GRATE DETAIL

STANDARD DROP INLET

12" - 24" PIPE: MAXIMUM DEPTH (H) = 10'

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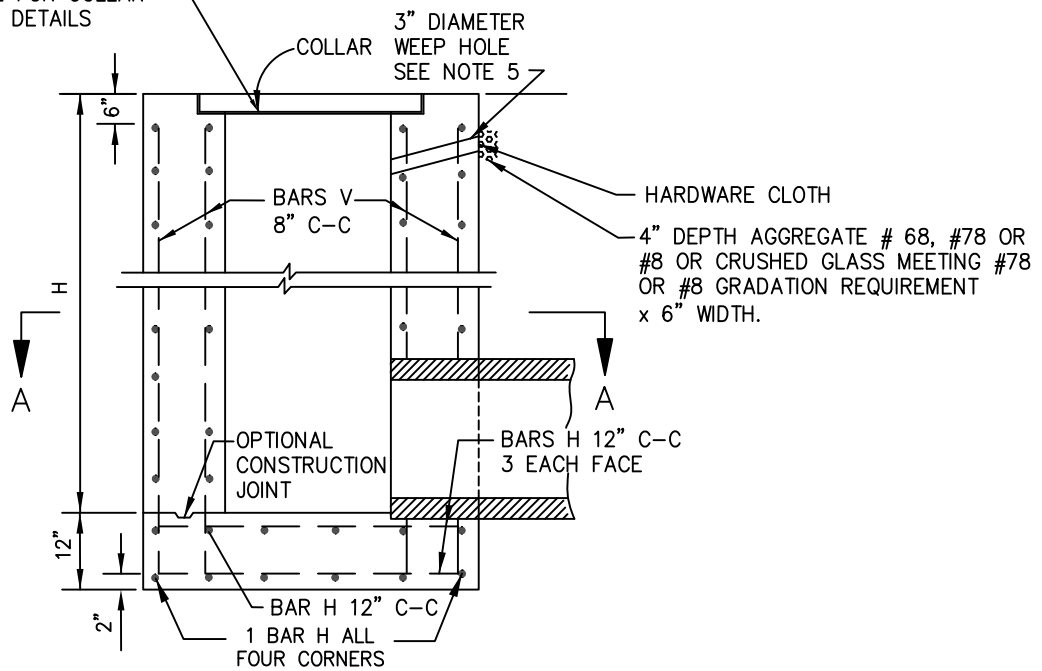
01/16/2021

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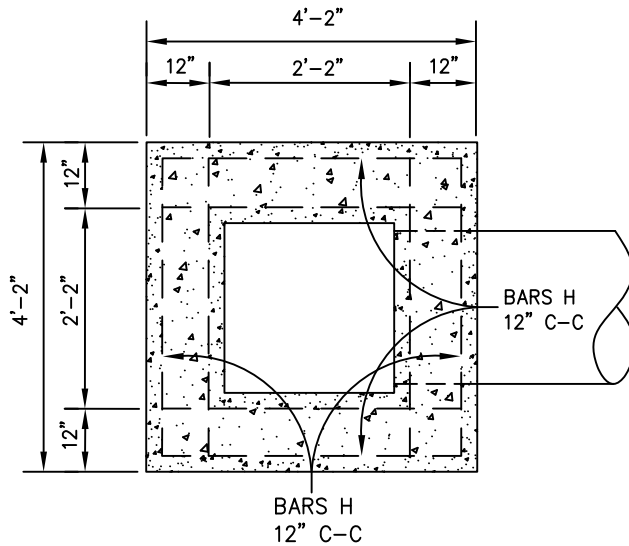
CSDI-2

PAGE 5

SEE CSDI-2 FOR COLLAR
AND GRATE DETAILS



SECTION THROUGH ELEVATION



SECTION A-A

REINFORCING STEEL SCHEDULE

MARK	SIZE	NO REQ'D	LENGTH
BARS H	#5	$8 \times (H + 2)$	3'-10"
BARS V	#4	40	$H + 4$ "

APPROXIMATE QUANTITIES
FOR MINIMUM (10') DEPTH

CONCRETE PIPE DIAMETER	CONCRETE	REINF. STEEL
	CU. YDS.	LBS.
12"	5.218	655
15"	5.193	651
18"	5.163	647
24"	5.089	639

INCREMENTS TO BE ADDED FOR EACH
ADDITIONAL FOOT OF DEPTH (H):
0.465 CU. YDS. OF CONCRETE
58.7 LBS. OF REINFORCING STEEL.

STANDARD DROP INLET

12" - 24" PIPE: DEPTH (H) 10' TO 20'

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01/16/2021

REVISION DATE

CSDI-2A

PAGE 6

GENERAL NOTES:

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. FOR DEPTH GREATER THAN 10' USE STANDARD CSDI-2A
2. THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR IN ACCORDANCE WITH CSIS-1 TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE.
3. THIS ITEM MAY BE PRECAST OR CAST- IN-PLACE.
4. # 4x8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE DESIGN.
5. 3" DIAMETER WEEP HOLE WITH 12"x12" PLASTIC HARDWARE CLOTH $\frac{1}{4}$ " MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03" NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
6. CAST IN PLACE CONCRETE IS TO BE CLASS A3 (3000PSI). PRECAST CONCRETE IS TO BE 4000PSI. REINFORCING STEEL TO HAVE A MINIMUM 2" COVER.
7. ANY ALTERNATE METHODS OF ANCHORAGE MEETING THE APPROVAL OF THE ENGINEER MAY BE SUBSTITUTED FOR THE CAST IRON LUGS AS SHOWN HEREON.
8. "DUMP NO WASTE DRAINS TO WATERWAY" LETTERING IS REQUIRED ON ALL CSDI-2 GRATES. LOCATION OF LETTERING MAY VARY BY MANUFACTURER.
9. IF DROP INLET IS TO BE INSTALLED ALONG A BIKE PATH THE GRATE OPENINGS SHALL BE ALIGNED PERPENDICULAR TO THE DIRECTION OF TRAVEL.
10. CONCRETE COVER AND GRATE ARE TO BE FURNISHED AS A SINGLE UNIT.
11. FOR DETAILS AND DIMENSIONS, ETC. OF GRATE AND STEEL OR CAST IRON COLLAR SEE STANDARD CSDI-2.
12. FOR RETROFIT PROJECTS:
 - A. PROVIDE CONCRETE BENCH (FOR TERMINAL USE BRICKS WITH SLOPE TOWARD OUTLET) UP TO CROWN OF PIPE INVERT. (IF REQUIRED)
 - B. GRADE AND SLOPE ADJUSTMENT SHALL BE PROVIDED IN THE FIELD BY CONTRACTOR PER APPROVED PLANS REQUIREMENTS.
IF THE STRUCTURE IS NOT PRECAST OR HAS ANGLE BETWEEN THE RCP PIPE AND STRUCTURE'S
 - C. PROVIDE ARCH BRICK ADJUSTMENT AROUND RCP PIPE
 - D. PROVIDE RAILS (IF REQUIRED)

STANDARD DROP INLET

GENERAL NOTES

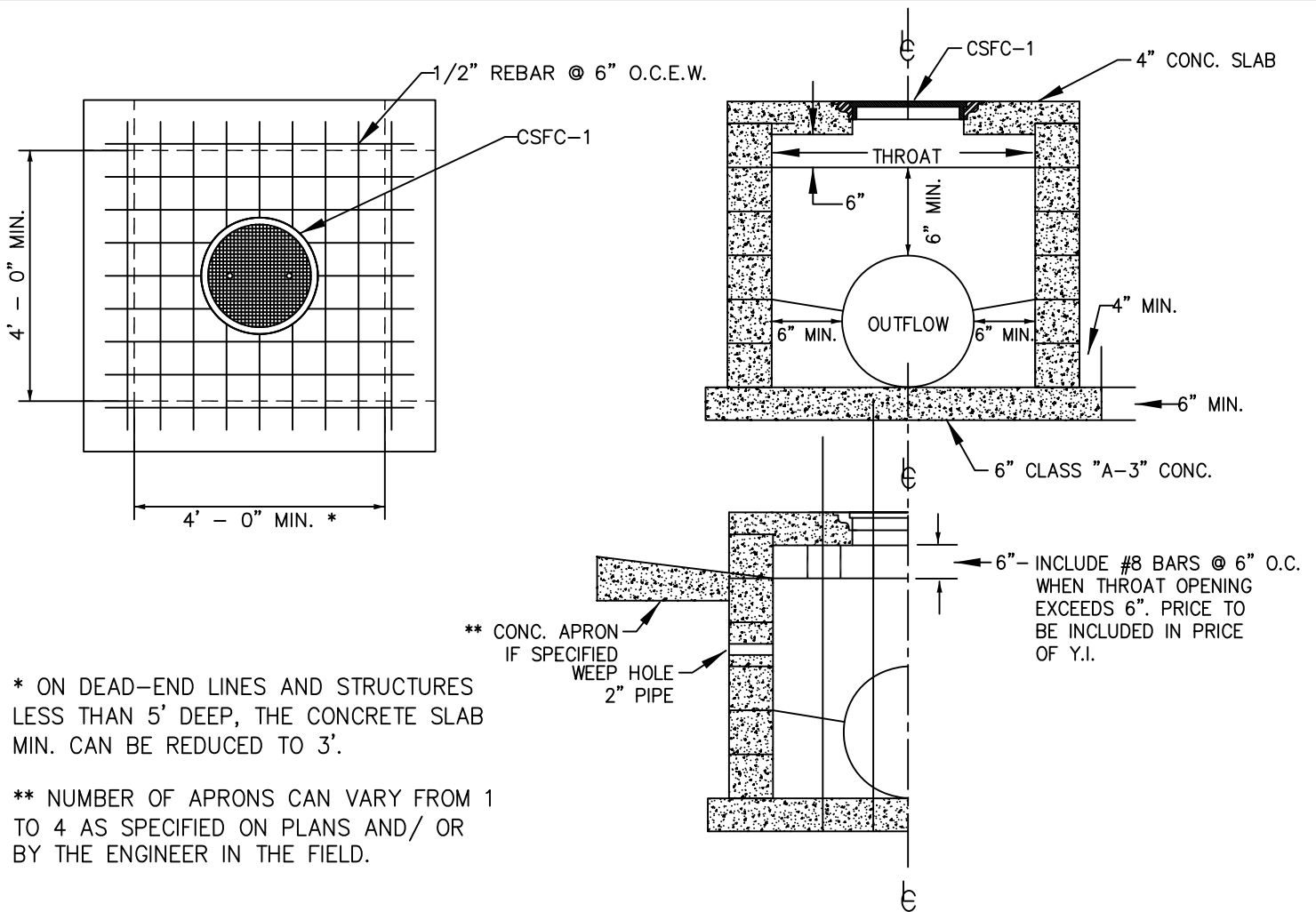
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01/16/2021

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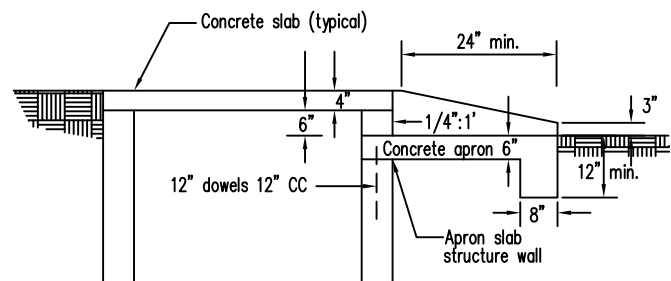
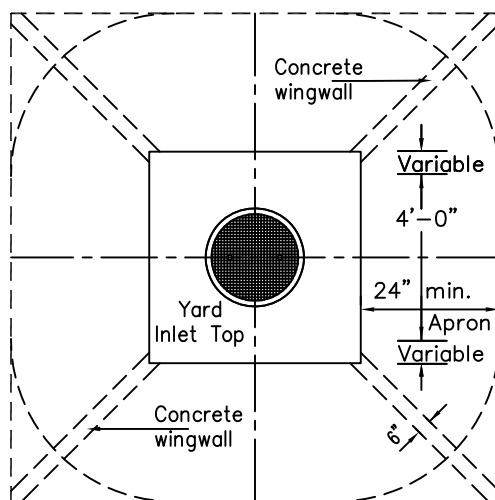
CSDI-2 & CSDI-2A

PAGE 7



* ON DEAD-END LINES AND STRUCTURES LESS THAN 5' DEEP, THE CONCRETE SLAB MIN. CAN BE REDUCED TO 3'.

** NUMBER OF APRONS CAN VARY FROM 1 TO 4 AS SPECIFIED ON PLANS AND/ OR BY THE ENGINEER IN THE FIELD.



TYPICAL CONCRETE APRON

YARD INLET

01/16/2021

REVISION DATE

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ALEXANDRIA, VIRGINIA

CSYI-1

PAGE 8

NOTES:

1. WHEN SPECIFIED, CONCRETE APRONS (1/4" PER FEET MIN) TO BE INCLUDED IN PRICE OF YARD INLET.
 2. CONCRETE APRON MAY BE CAST IN PLACE OR PRECAST.
REINFORCING MUST BE 6"x6" NO 6 WIRE MESH. ALL CONCRETE MUST BE CLASS A3.
 3. AN 6" THICK CONC. APRON 2' WIDE (MIN.) WILL BE INSTALLED IN FRONT OF EACH THROAT. THEY WILL BE SHAPED TO MEET CONDITIONS AS DIRECTED IN THE FIELD BY CITY INSPECTOR.
 4. CLASS "A3" CONC. USED THROUGHOUT.
WALLS OF POURED OR BLOCK CONC. OR BRICK IN MORTAR WILL BE PARGED 1/4" INSIDE (AND OUTSIDE ABOVE FINISHED GRADE).
 5. WALLS OF POURED OR SOLID BLOCK CONCRETE WILL BE 8" THICK.
 6. SPECIAL DESIGN WILL BE REQUIRED FOR PIPE SIZES GREATER THEN 36".
 7. FOR RETROFIT PROJECTS:
 - A. PROVIDE CONCRETE BENCH (FOR TERMINAL USE BRICKS WITH SLOPE TOWARD OUTLET) UP TO CROWN OF PIPE INVERT. (IF REQUIRED)
 - B. GRADE AND SLOPE ADJUSTMENT SHALL BE PROVIDED IN THE FIELD BY CONTRACTOR PER APPROVED PLANS REQUIREMENTS.
- IF THE STRUCTURE IS NOT PRECAST OR HAS ANGLE BETWEEN THE RCP PIPE AND STRUCTURE'S
- A. PROVIDE ARCH BRICK ADJUSTMENT AROUND RCP PIPE
 - B. PROVIDE RAILS (IF REQUIRED)

YARD INLET

GENERAL NOTES

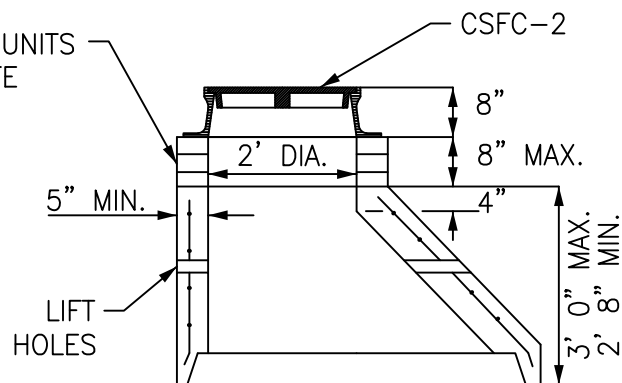
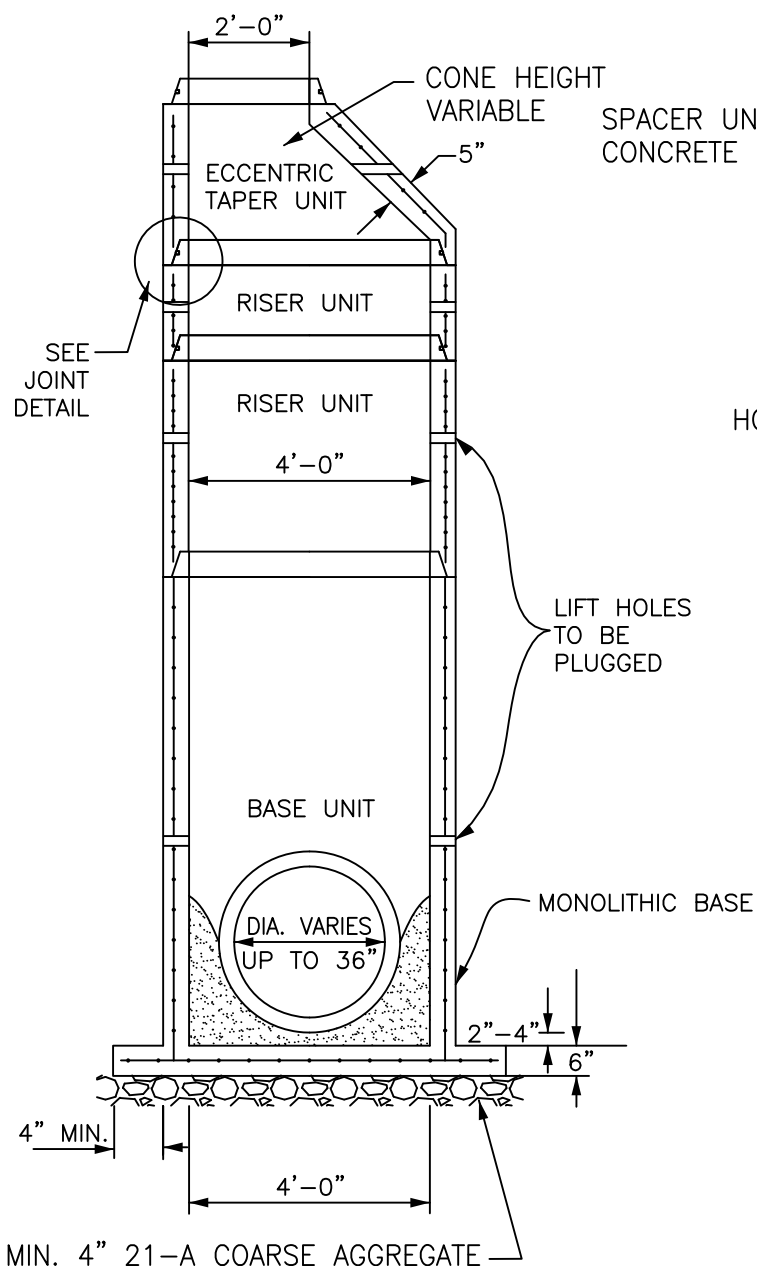
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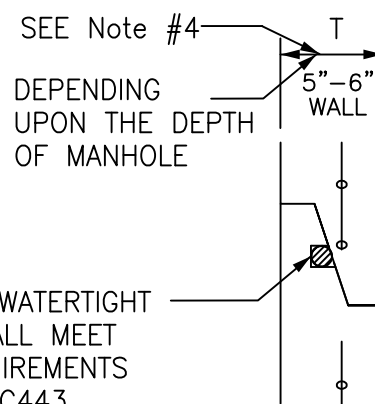
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CSYI-1

PAGE 9



TOP UNIT DETAIL



FLEXIBLE WATERTIGHT JOINT SHALL MEET THE REQUIREMENTS OF ASTM C443

N.T.S.

NOTE:
FOR REINFORCEMENT SCHEDULE SEE CSMH-2, PAGE 11.

PRECAST MANHOLE

4' INSIDE DIAMETER; FOR PIPES UP TO 36" IN DIAMETER

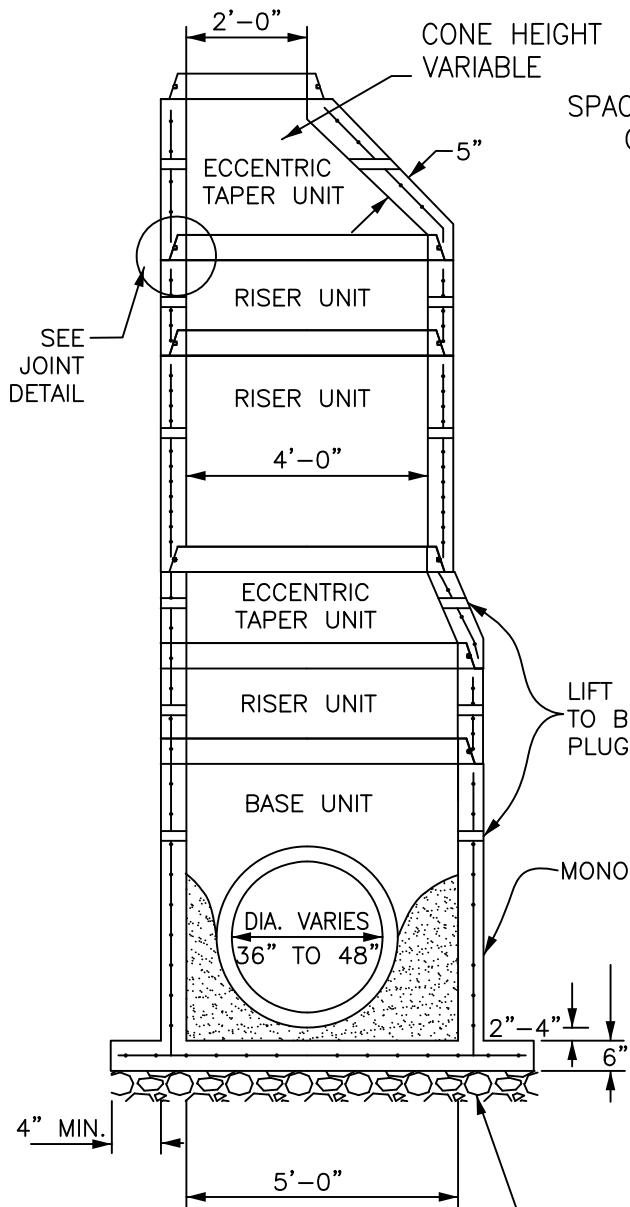
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01/16/2021

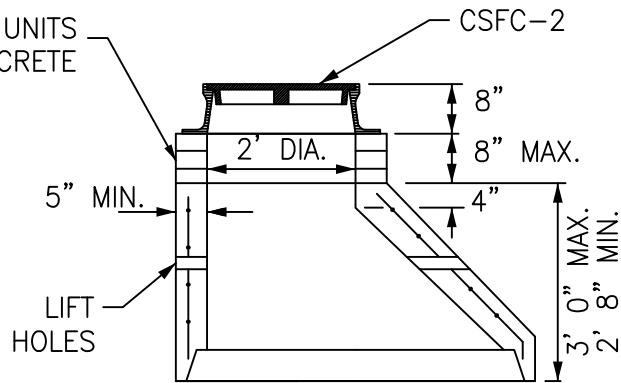
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CSMH-1

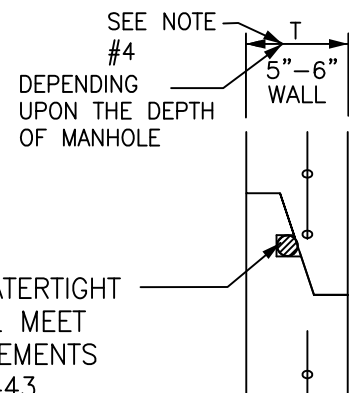
PAGE 10



MIN. 4" 21-A COARSE AGGREGATE
N.T.S.



TOP UNIT DETAIL



FLEXIBLE WATERTIGHT
JOINT SHALL MEET
THE REQUIREMENTS
OF ASTM C443

REINFORCEMENT SCHEDULE FOR 4' AND 5' INSIDE DIAMETER MANHOLES

Depth	Wall Thickness	Wall Reinforcement	Base Slab Thickness	Base Slab Reinforcement
<12'	5"	#4 @ 8" EW	6"	#4 @ 8" EW
>12'	6"	#4 @ 8" EW	6"	#4 @ 8" EW

PRECAST MANHOLE

5' INSIDE DIAMETER; FOR PIPES 36" TO 48" IN DIAMETER

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ALEXANDRIA, VIRGINIA

01/16/2021

REVISION DATE

CSMH-2

PAGE 11

NOTES:

1. THE MANHOLE SHALL BE DESIGNED TO MEET HS-20 LOADING CAPACITY.
2. JOINTS BETWEEN UNITS SHALL BE TONGUE & GROOVE.
3. PIPE MUST BE FLUSH WITH INSIDE WALL OF MANHOLE.
4. WALLS TO DEPTH OF 12' TO BE 5" THICK. WALLS DEEPER THAN 12' TO BE 6".
5. LOSS FOR STRAIGHT RUN MANHOLE SHALL BE 0.05 FEET. IN NO CASE SHALL LOSS LESS THAN 0.05 FEET BE ALLOWED.
6. FOR RETROFIT PROJECTS:
 - A. PROVIDE CONCRETE BENCH (FOR TERMINAL USE BRICKS WITH SLOPE TOWARD OUTLET) UP TO CROWN OF PIPE INVERT. (IF REQUIRED)
 - B. GRADE AND SLOPE ADJUSTMENT SHALL BE PROVIDED IN THE FIELD BY CONTRACTOR PER APPROVED PLANS REQUIREMENTS.IF THE STRUCTURE IS NOT PRECAST OR HAS ANGLE BETWEEN THE RCP PIPE AND STRUCTURE'S
 - C. PROVIDE ARCH BRICK ADJUSTMENT AROUND RCP PIPE
 - D. PROVIDE RAILS (IF REQUIRED)
7. THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR IN ACCORDANCE WITH CSIS-1 TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE.

PRECAST MANHOLE

GENERAL NOTES

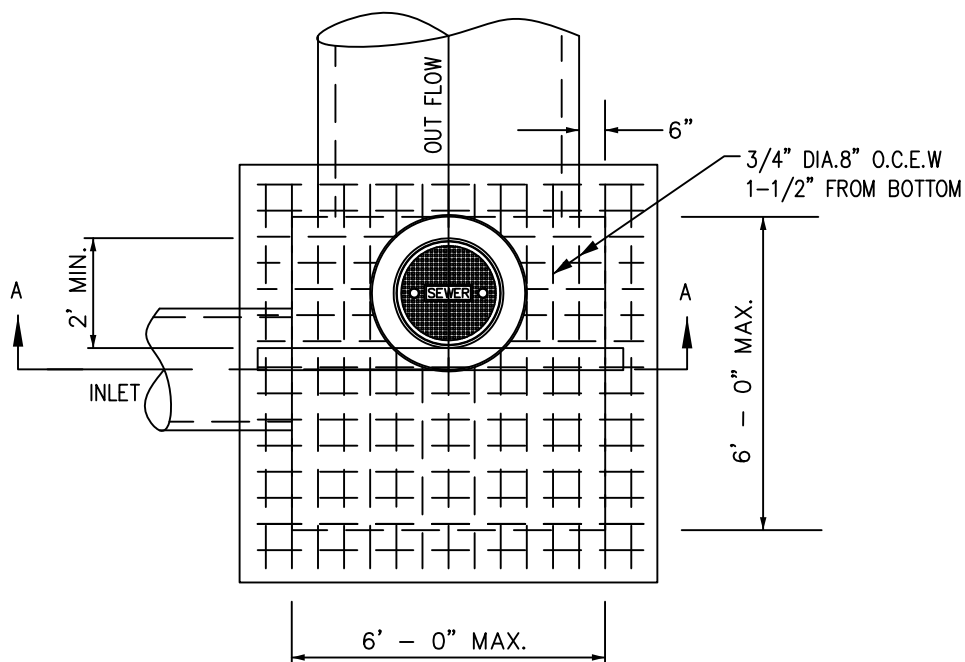
01/16/2021

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ALEXANDRIA, VIRGINIA

CSMH-1 & CSMH-2

PAGE 12

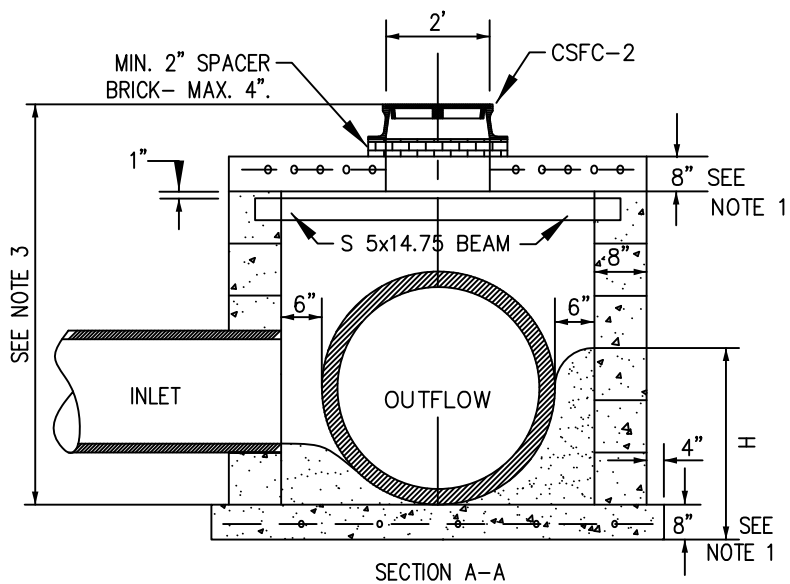


WITHOUT SPECIAL DESIGN
(O.D. + 1' (MIN. 4'))

PLAN

REINFORCEMENT SCHEDULE

	SLAB	THICKNESS	REINFORCEMENT
IN STREET	TOP	8"	#6 @ 8" EW
	BOTTOM	8"	#6 @ 10" EW
NOT IN STREET	TOP	6"	#4 @ 8" EW
	BOTTOM	6"	#4 @ 8" EW



SECTION A-A

NOTES:

1. TOP AND BOTTOM SLABS MAY BE 6" MIN. WHEN NOT CONSTRUCTED IN A STREET.
2. CONSTRUCTION OF CLASS "A3" CONC., CONC. BLOCK, OR BRICK IN MORTAR, PARGED INSIDE (AND OUTSIDE ABOVE FINISHED GRADE) 1/4" MIN.
3. CSJB-1 TO BE USED WHEN THE DISTANCE FROM THE TOP OF CASTING IS LESS THAN 3'-8" OR WHEN THE SIZE OF THE PIPE REQUIRES ITS USE.
4. HEIGHT OF BENCH H TO BE AS SPECIFIED ON THE APPROVED PLAN.
5. MANHOLE COVER AND FRAME ARE TO BE LOCATED ABOVE THE CENTERLINE OF THE OUTFLOW PIPE.
6. THE TOPS OF SMALLER INFLOW WILL BE AT LEAST AS HIGH AS THE TOP OF THE LARGEST INFLOW PIPE.

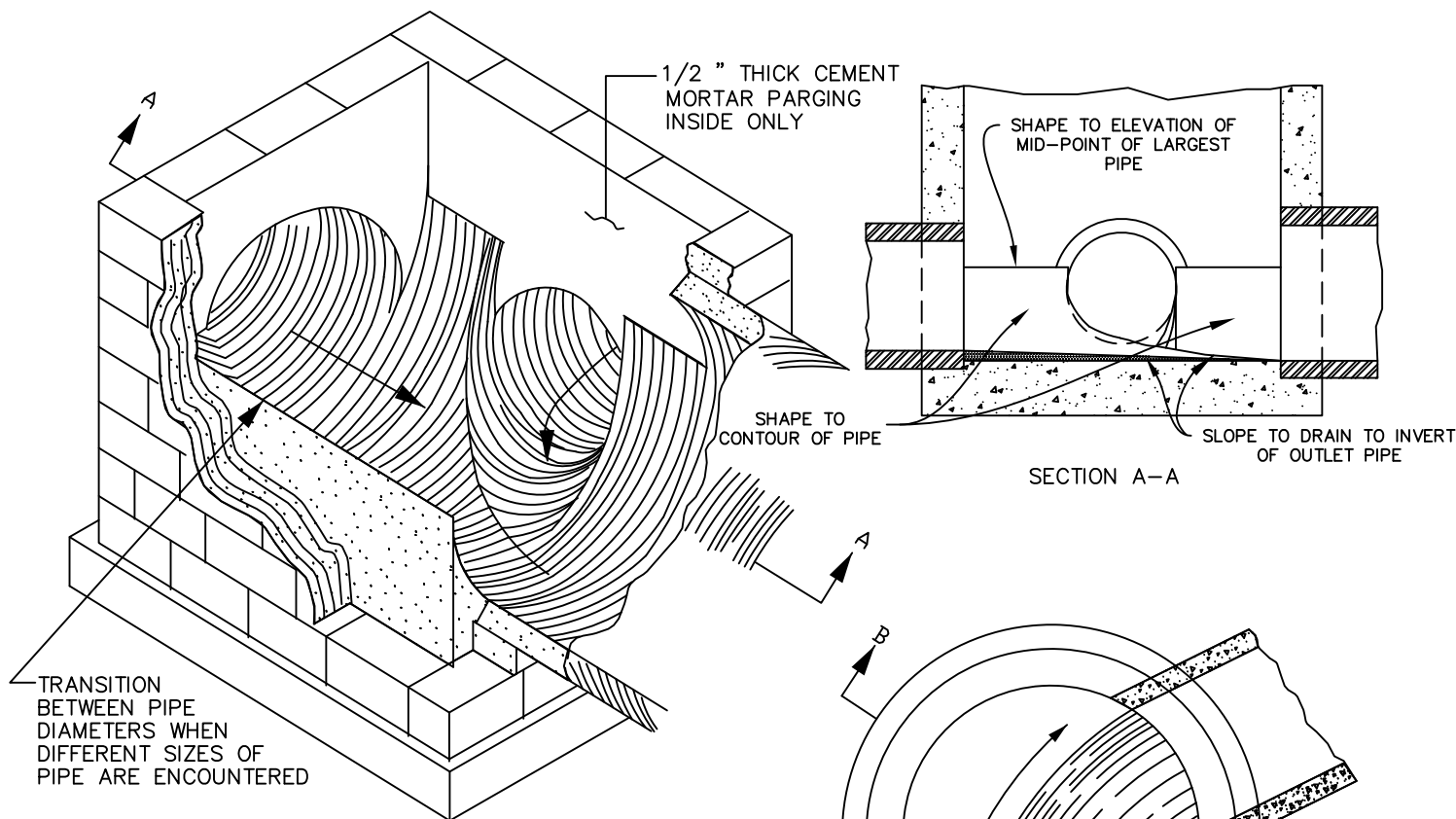
STORM SEWER JUNCTION BOX

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CSJB-1

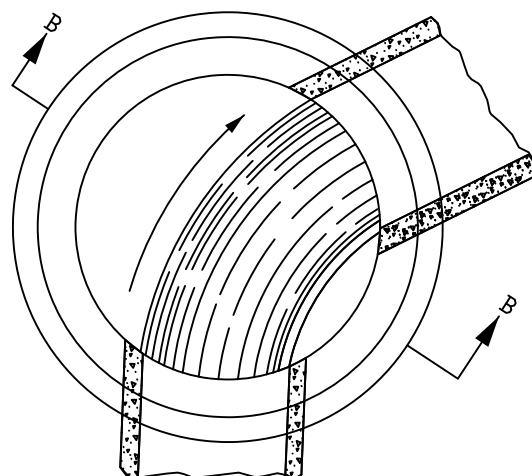
PAGE 13



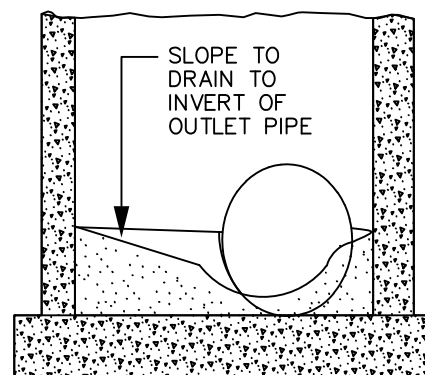
METHOD FOR SHAPING OF DROP INLETS
AND STANDARD MANHOLE INTERIORS

NOTES:

1. SHAPING OF MANHOLE AND INLET INVERTS IN ACCORDANCE WITH THIS DRAWING IS TO APPLY TO THOSE STRUCTURES SPECIFIED ON PLANS. THE COST OF FURNISHING AND PLACING ALL MATERIALS IS TO BE INCLUDED IN THE PRICE BID FOR THE PARTICULAR CATCH BASIN OR MANHOLE COMPLETE.
2. MANHOLE OR CATCH BASIN IS TO BE FORMED AND CONSTRUCTED IN ACCORDANCE WITH APPLICABLE STANDARD OR SPECIAL DRAWING. THE INVERT SHAPING AS DE-TAILED HEREON IS TO CONSIST OF A PORTLAND CEMENT CONCRETE MIX CONFORMING TO CLASS A3. THE SURFACE SHALL BE LEFT SMOOTH BY MEANS OF HAND TROWELLING. NONE OF THE COARSE AGGREGATE SHALL REMAIN EXPOSED
3. INVERT TO BE PAVED TO THE SHAPE OF THE PIPE AND TO THE SPRING LINE EXCEPT WHERE INLET AND OUTLET PIPE MAKE AN ANGLE WITH EACH OTHER IN WHICH CASE PAVING SHALL BE TO THE CROWN OF THE OUTLET PIPE. THEN FROM THE SPRING LINE OR THE CROWN, WHICHEVER IS THE CASE, THE PAVING IS TO BE EXTENDED UPWARD AT A 45° ANGLE TO MEET THE STRUCTURE WALL.
4. DETAILS OF INVERT SHAPING AS SHOWN HEREON ARE FOR EXAMPLE PURPOSES ONLY. EACH MANHOLE OR CATCH BASIN IS TO BE SHAPED INDIVIDUALLY TO BEST FIT THE PARTICULAR INLET AND OUTLET CONFIGURATION AND FLOW LINES.



TREATMENT IN PRECAST MANHOLES

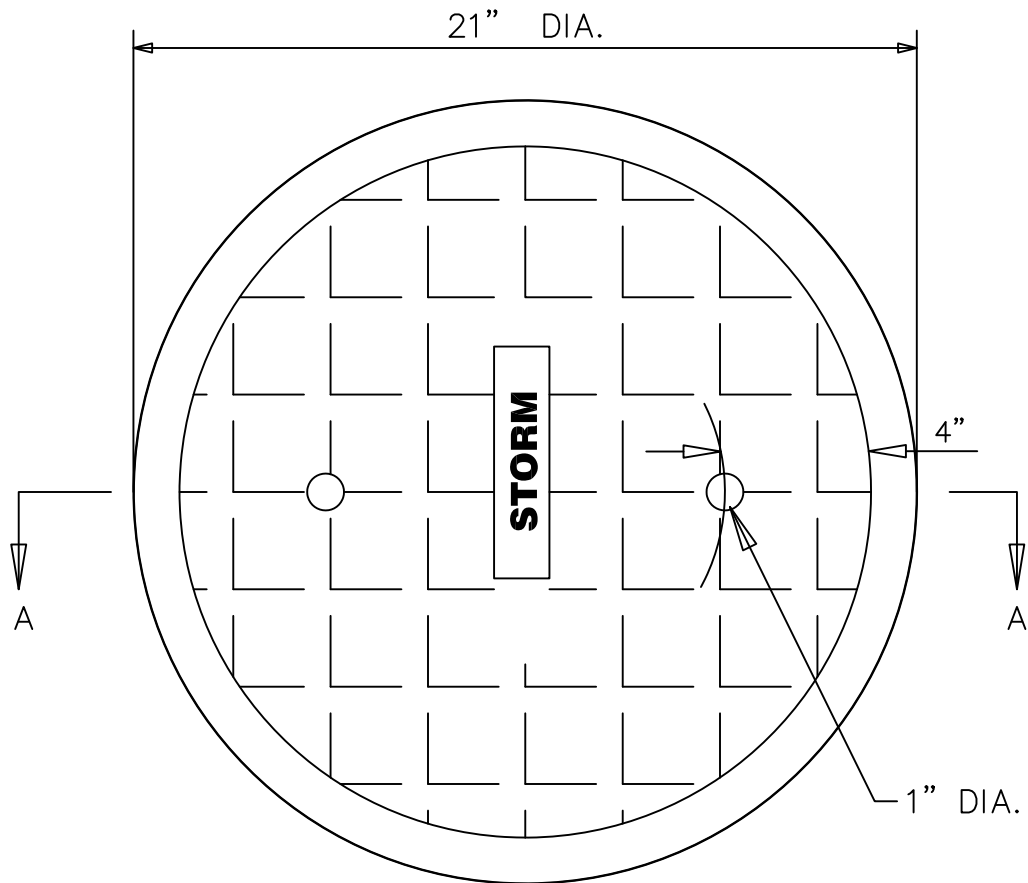


SECTION B-B

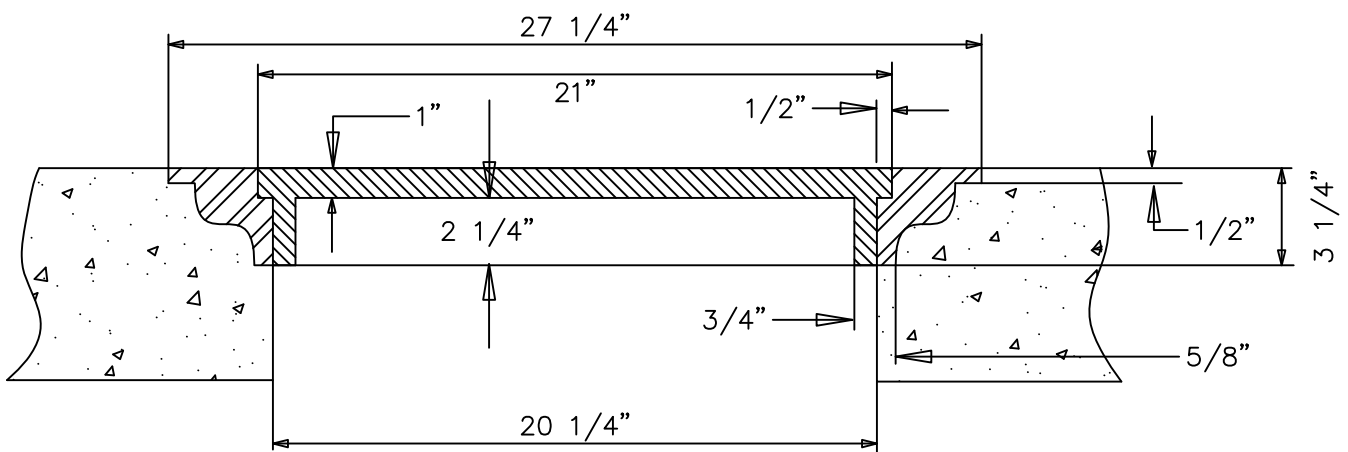
SHAPING MANHOLE AND INLET INVERTS

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRA, VIRGINIA

01/16/2021	REVISION	DATE
CSIS-1		
PAGE 14		



TOP VIEW



SECTION A - A

YARD & CURB DROP INLET FRAME & COVER

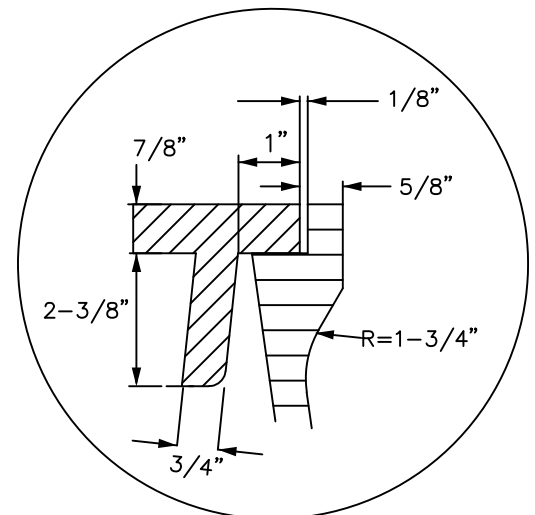
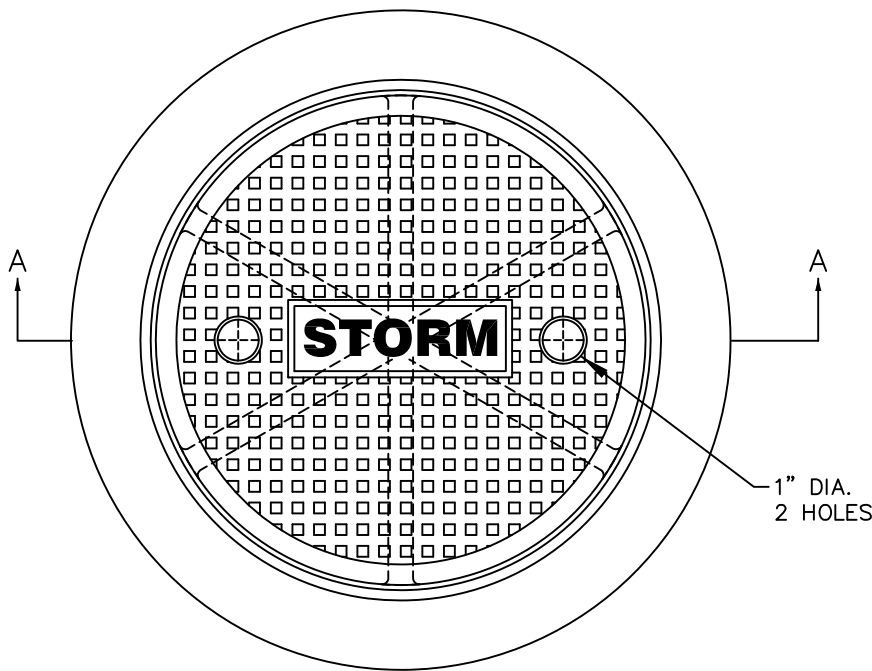
01/16/2021

REVISION DATE

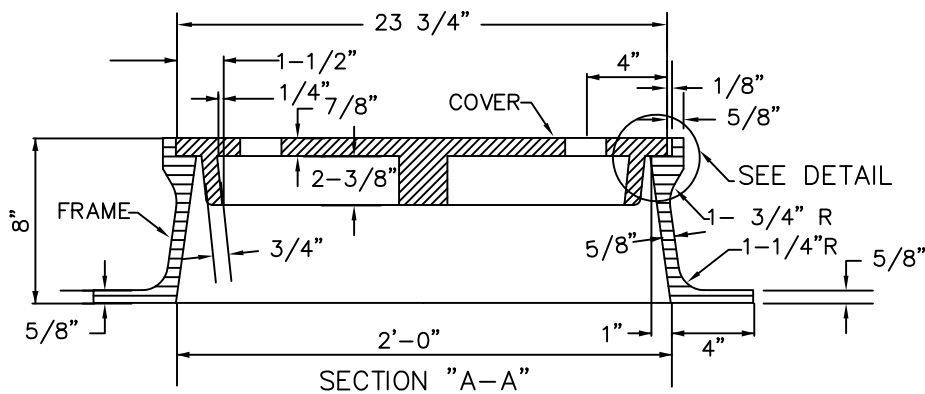
CSFC-1

PAGE 15

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA



DETAIL NOT TO SCALE



NOTE :

TOP AND CASTING TO BE
MACHINED.

FRAME WEIGHT 200 LBS.

COVER WEIGHT 125 LBS.

TOTAL WEIGHT 325 LBS.

MANHOLE FRAME & COVER

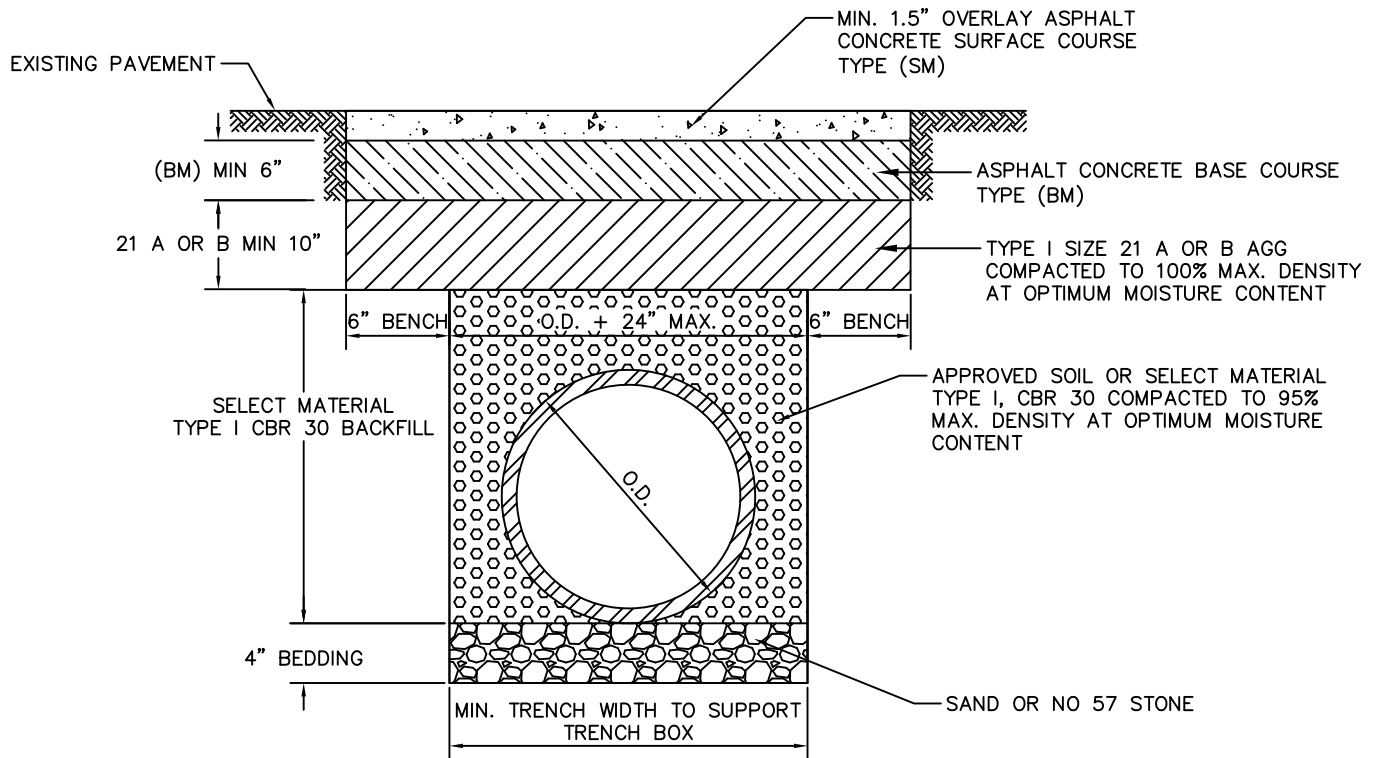
01/16/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSFC-2

PAGE 16



DETAIL NOT TO SCALE

NOTES:

1. BACKFILL MATERIAL SHALL BE COMPACTED AT A MAXIMUM DEPTH OF EVERY SIX INCHES (6") THROUGH THE USE OF MECHANICAL TAMPING THROUGHOUT THE TRENCH TO ENSURE THAT ADEQUATE SUPPORT IS PROVIDED.
2. PAVEMENT RESTORATION IS 12 INCHES MINIMUM BEYOND THE EDGE OF THE TRENCH ON LONGITUDINAL OPEN CUTS, OR 25 FEET MINIMUM BEYOND THE TRENCH CENTERLINE ON PERPENDICULAR OPEN CUTS, OR AS DETERMINED BY THE T&ES DIRECTOR.
3. PAVEMENT RESTORATION ALSO INCLUDES THE REPLACEMENT OF ANY TRAFFIC CONTROL DEVICES AND/OR MARKINGS.
4. PAVEMENT THAT HAS BEEN RESURFACED WITHIN THE LAST FIVE (5) YEARS; PAVEMENT RESTORATION SHALL BE AT A MINIMUM WIDTH FROM CURB TO CURB AND LONGITUDINALLY PER NOTE #2. ADDITIONAL PAVING AND RESTORATION MAY BE REQUIRED, AS DETERMINED BY THE T&ES DIRECTOR.

BEDDING FOR PIPE & TRENCH SECTIONS

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

01/16/2021

REVISION DATE

CSJT-1

PAGE 17

STANDARD NUMBER

TITLE

PAGE

SECTION 2 SANITARY SEWERS AND WATER

CSFH-1	Fire Hydrant Installation	18
CSFH-1A	Fire Hydrant Installation Notes	19
CSAB-1	Concrete Anchor Block	20
SCHB-1	Hydrant Bollards	21
CSLC-1A & CSLC-1B	Sanitary Sewer Lateral Connection	22 & 23
CSLC-1C	Sanitary Sewer Lateral Connection Notes	24
CSCO-1	Sanitary Sewer Cleanout	25
CSSE-1	Sewer Pipe Encasement and High Cradle	26
CSMH-3	Precast Manhole	27
CSMH-4 & CSMH-4A	Manhole (Drop) & Manhole (Drop) Notes	28 & 29
CSMH-5	Doghouse Manhole	30
CSFC-3	Manhole Frame & Cover	31
CSFC-4	Manhole Frame & Cover (Bolted-Watertight)	32
CSMA-1	Manhole (Grade Rim Adjustment)	33
CSMA-1A	Modified Manhole Adjustments	34
CSTB-1 & CSTB-1A	Trench Bedding & Backfill Details & Notes for PVC	35 & 36
CSTB-2 – CSTB-2B	Trench Bedding & Backfill Details & Notes for DIP	37 – 39
CSIS-2	Manhole Shaping	40
CSMA-1	Manhole Abandonment	41
CSPA-1	Pipe Abandonment	42

TABLE OF CONTENTS

06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

(2)

NOTES:

1. FIRE HYDRANT: MUELLER CENTURION – CATALOG # A423 WITH 1 1/2 INCH PENTAGON OPERATING NUT; LEFT TURN TO OPEN TWO 2 1/2" HOSE NOZZLES AND ONE 4" HOSE NOZZLE.
2. VALVE: MUELLER GATE VALVE – CATALOG # A2380-20, WITH 6 INCH MECHANICAL JOINTS. 2 INCH SQUARE NUT, LEFT TURN TO OPEN. VALVES AND FITTINGS SHALL BE WRAPPED IN 10MIL. OR THICKER POLYETHYLENE.
3. ALL FITTINGS SHALL BE DUCTILE IRON. ALL FITTINGS TO BE RESTRAINED.
4. LOCATIONS TO BE AS SHOWN ON PLANS. VARIANCE OF THE 2' MIN. FROM THE FACE OF THE CURB SHALL BE REVIEWED ON AN INDIVIDUAL BASIS BY THE TRANSPORTATION AND ENVIRONMENTAL SERVICES ENGINEER.
5. FIRE HYDRANTS TO BE INSTALLED AND TESTED IN ACCORDANCE WITH CURRENT VERSION OF AWWA M17 MANUAL.
6. VALVES AND SERVICE LINES ARE TO BE INSTALLED AND TESTED IN ACCORDANCE WITH THE CURRENT VERSION OF AWWA G200-09 DISTRIBUTION SYSTEMS AND M44 DISTRIBUTION VALVES; SELECTION, INSTALLATION, FIELD TESTING, AND MAINTENANCE, 3RD ED.
7. PRIOR TO ACCEPTANCE BY THE CITY OF ALEXANDRIA, FIELD TESTING AND PRESSURE READINGS SHALL BE PROVIDED BY THE CONTRACTOR.
8. FIRE HYDRANTS SHALL BE LOCATED AT EACH STREET INTERSECTION. THERE SHALL BE AT LEAST ONE FIRE HYDRANT LOCATED AT EACH INTERSECTION. THE MAXIMUM DISTANCE BETWEEN FIRE HYDRANTS IN BUSINESS DISTRICTS, MEASURING ALONG STREET CENTERLINES, SHALL BE 300 FEET. ALL PARTS OF EACH BUILDING SHALL BE WITHIN 500 FEET OF HOSE RUN FROM A FIRE HYDRANT. THE MAXIMUM DISTANCE BETWEEN FIRE HYDRANTS IN RESIDENTIAL DISTRICTS, MEASURED ALONG STREET CENTERLINES, SHALL NOT EXCEED 500 FEET.
9. PRIOR TO INSTALLATION OF PRIVATE HYDRANTS, AMERICAN WATER IS TO SIGN OFF ON THE HYDRANT LOCATION.
10. HYDRANTS SHALL NOT BE USED AS TEMPORARY BLOW-OFFS DURING CONSTRUCTION.
11. NO VERTICAL OBSTRUCTIONS SHALL BE WITHIN 10' OF EITHER SIDE OR REAR OF HYDRANT.
12. SPECIFY BOLLARDS WHERE HYDRANTS ARE UNPROTECTED BY CURB AND GUTTER, PLACED IN OPEN SPACE OR AT THE REAR OF COMMERCIAL BUILDINGS.
13. FIRE HYDRANTS SHALL BE PLACED AT SIGNIFICANT HIGH POINTS OF MAINS TO RELEASE AIR.
14. TO ENABLE THE DRAINING AND FLUSHING OF ALL MAINS, SPECIFY FIRE HYDRANTS AT SIGNIFICANT LOW POINTS.
15. LANDSCAPING, TREES, BMP'S, SIGNS, SIGNALS, LIGHT POLES, AND/OR OTHER UTILITIES ARE NOT PERMITTED TO BE WITHIN 5 FEET OF A HYDRANT.
16. WHEN INSTALLED IN PARKING AREA, FIRE HYDRANT SHALL BE PROTECTED BY BARRIERS THAT WILL PREVENT PHYSICAL DAMAGE BY VEHICLES.
17. IN THE CITY OF ALEXANDRIA, PUBLIC AND PRIVATE FIRE HYDRANTS ARE LOCATED AND MAINTAINED TO ASSURE THE APPROPRIATE SUPPLY OF WATER IS AVAILABLE FOR FIREFIGHTING PURPOSES. ALL PUBLIC FIRE HYDRANTS ARE THE PROPERTY OF THE CITY OF ALEXANDRIA. ALL FIRE HYDRANTS LOCATED ON PRIVATE PROPERTY ARE THE OWNERSHIP AND MAINTENANCE RESPONSIBILITY OF THE PROPERTY OWNER. IN ORDER TO PROVIDE FOR FIREFIGHTING PURPOSES, IT IS NECESSARY THAT ALL FIRE HYDRANTS BE EASILY RECOGNIZABLE TO AVOID BEING BLOCKED OR OBSTRUCTED. TO AID IN MAINTAINING THE IDENTIFIABLE APPEARANCE AND BY ORDER OF THE FIRE CHIEF, ALL FIRE HYDRANTS SHALL BE PAINTED AS DIRECTED;
 - A. ALL PUBLIC AND PRIVATE HYDRANT BARRELS AND EXTENSIONS SHALL BE PAINTED WITH THE APPROVED: SHERWIN WILLIAMS "SAFETY YELLOW" #B54YZ437
 - B. ALL PUBLIC HYDRANT BONNETS AND CAPS SHALL BE PAINTED WITH AN APPROVED REFLECTIVE WHITE: SHERWIN WILLIAMS "PURE WHITE" # B54WZ401
 - C. ALL PRIVATE HYDRANT BONNETS SHALL BE PAINTED WITH THE APPROVED: SHERWIN WILLIAMS "SAFETY YELLOW" #B54YZ437
 - D. ALL PRIVATE HYDRANT CAPS SHALL BE PAINTED WITH THE APPROVED: SHERWIN WILLIAMS "PURE WHITE" #B54WZ401
 - E. HYDRANT BARRELS AND EXTENSIONS MAY BE PAINTED WITH AN APPROVED FLAT BLACK IN THE HISTORIC AND OLD TOWN AREAS OF THE CITY WHEN SPECIFICALLY APPROVED IN WRITING BY THE FIRE CHIEF.

FIRE HYDRANT INSTALLATION NOTES

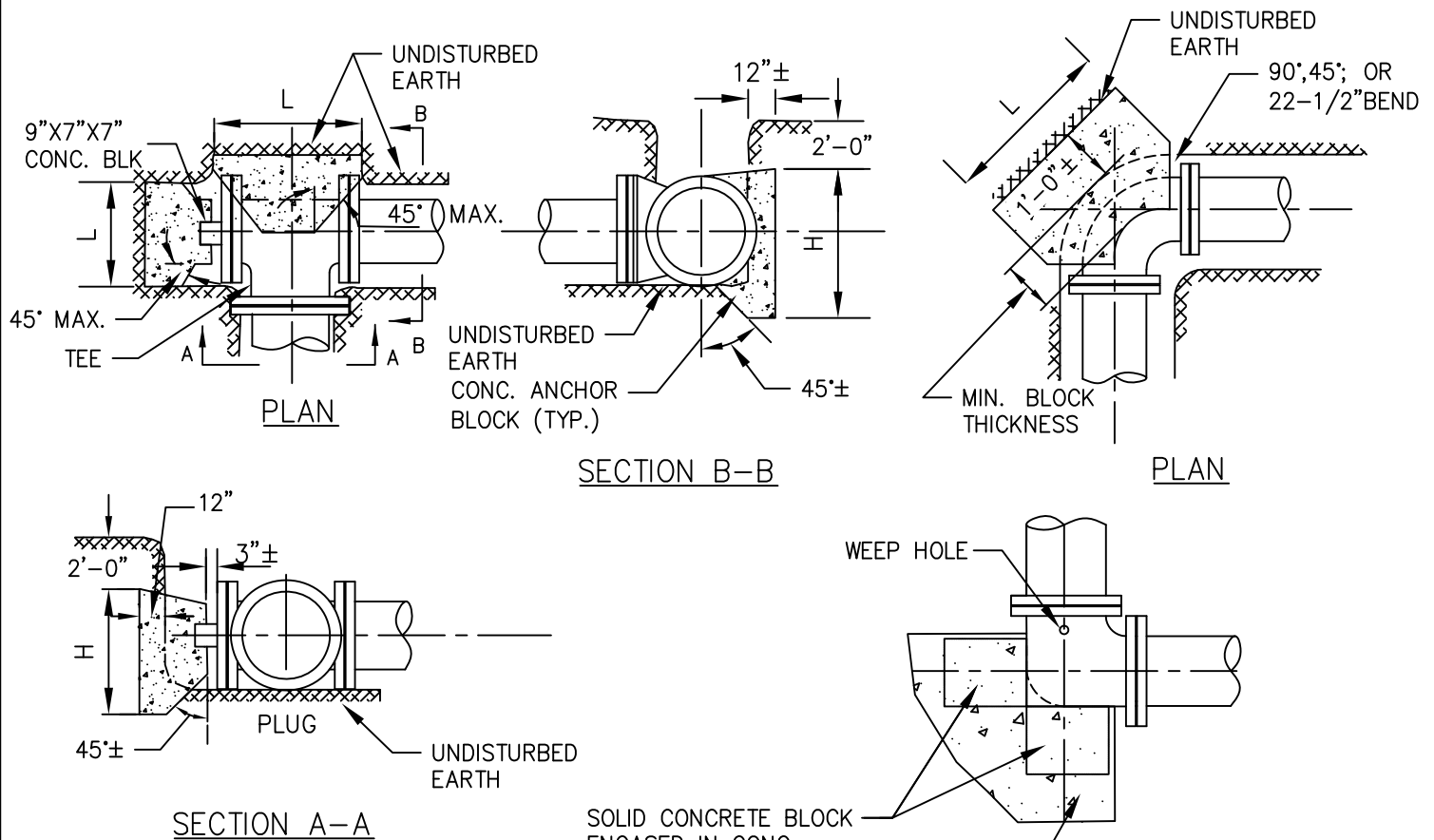
06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSFH-1A

PAGE 19



NOTES:

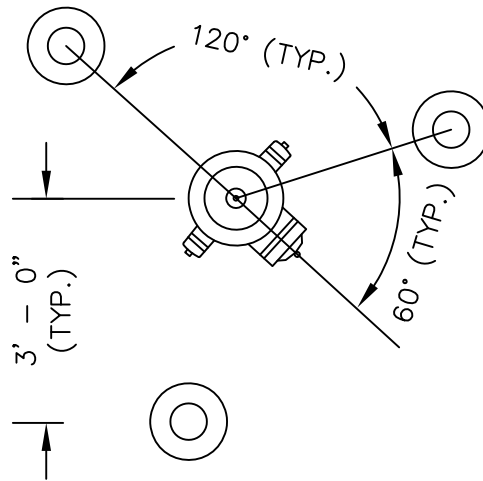
1. ALL MATERIAL SHALL BE REMOVED FROM THE VALVE BODY AND STEAM AREA PRIOR TO ACCEPTANCE.
2. THE VALVE MUST HOLD IN THE CLOSED POSITION.
3. WRAP FITTING WITH POLYETHYLENE SHEETING.
4. CONCRETE TO BE CLASS B2 (2200 PSI) OR BETTER.
5. BLOCKING MUST NOT OBSTRUCT ACCESS TO MECHANICAL JOINT ASSEMBLY.
6. AT TEE USE DIMENSIONS DEAD END OF SAME DIAMETER AS BRANCH OF TEE.
7. TABLE IS BASED ON $R=2P\sin(\theta/2)$, A SOIL BEARING OF 3000 PSF, A TEST PRESSURE OF 150 PSI, AND A SAFETY FACTOR OF 1.5. INCREASE BLOCKING DIMENSIONS AS REQUIRED IN SOILS WITH LOWER BEARING VALUES.
8. FOR FITTINGS LARGER THAN 24", BLOCKING SHALL BE DESIGNED ON PROJECT SPECIFIC BASIS.
9. APPROXIMATE VOLUME OF CONCRETE REQUIRED FOR VARIOUS SIZE BENDS AT 100psi WORKING PRESSURE & MINIMUM BLOCK THICKNESS OF 1'-9" FOR 6", 8", 12" & 16" PIPE, 1'-6" FOR 20" PIPE & 1'-4" FOR 24" PIPE.

PIPE SIZE INCHES	DEGREE OF BEND	MINIMUM CONCRETE ANCHOR BLOCK DIMENSIONS – FEET										VOLUME OF CONCRETE CU. YD.(1)
		WORKING PRESSURE										
		75 PSI		100 PSI		125 PSI		150 PSI		175 PSI		
		L	H	L	H	L	H	L	H	L	H	
6	90	2.5	1.0	2.5	1.5	2.0	2.0	2.5	2.0	3.0	2.0	0.24
	45	1.5	1.0	2.0	1.0	2.0	1.0	2.5	1.0	2.0	1.5	0.13
	11-1/4/22-1/2	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.0	1.5	1.0	0.06
8	90	2.0	2.0	2.5	2.5	3.0	2.5	4.0	2.0	4.0	2.5	0.40
	45	2.5	1.0	2.0	1.5	2.0	2.0	2.5	2.0	2.5	2.0	0.19
	11-1/4/22-1/2	1.5	1.0	1.5	1.0	2.0	1.0	2.5	1.0	2.0	1.5	0.10
12	90	3.0	3.0	4.0	3.0	5.0	3.0	5.0	4.0	5.5	4.0	0.78
	45	2.5	2.0	3.5	2.0	4.0	2.5	4.0	2.5	4.0	3.0	0.45
	11-1/4/22-1/2	2.5	1.0	2.5	1.5	2.5	2.0	2.5	2.0	3.0	2.0	0.24
16	90	5.0	3.5	5.5	4.0	6.0	4.5	7.5	4.5	7.5	5.0	1.43
	45	4.0	2.5	4.0	3.0	5.0	3.0	5.0	3.5	5.0	4.5	0.78
	11-1/4/22-1/2	2.5	2.0	3.0	2.0	3.0	2.5	3.0	3.0	4.0	3.0	0.39
20	90	5.5	4.5	6.5	5.5	7.5	5.5	8.5	6.0	9.5	6.0	1.99
	45	4.0	3.5	5.0	4.0	5.5	4.0	6.0	4.5	7.0	4.5	1.11
	11-1/4/22-1/2	3.0	2.5	3.5	3.0	4.0	3.0	4.5	3.0	5.5	3.0	0.58
24	90	6.5	5.5	8.0	6.0	9.5	6.5	11.0	6.5	13.0	6.5	2.37
	45	5.0	4.0	5.5	5.0	7.5	4.5	7.0	5.5	9.0	5.0	1.36
	11-1/4/22-1/2	3.5	3.0	4.0	3.4	5.0	3.5	5.0	4.0	6.0	4.0	0.69

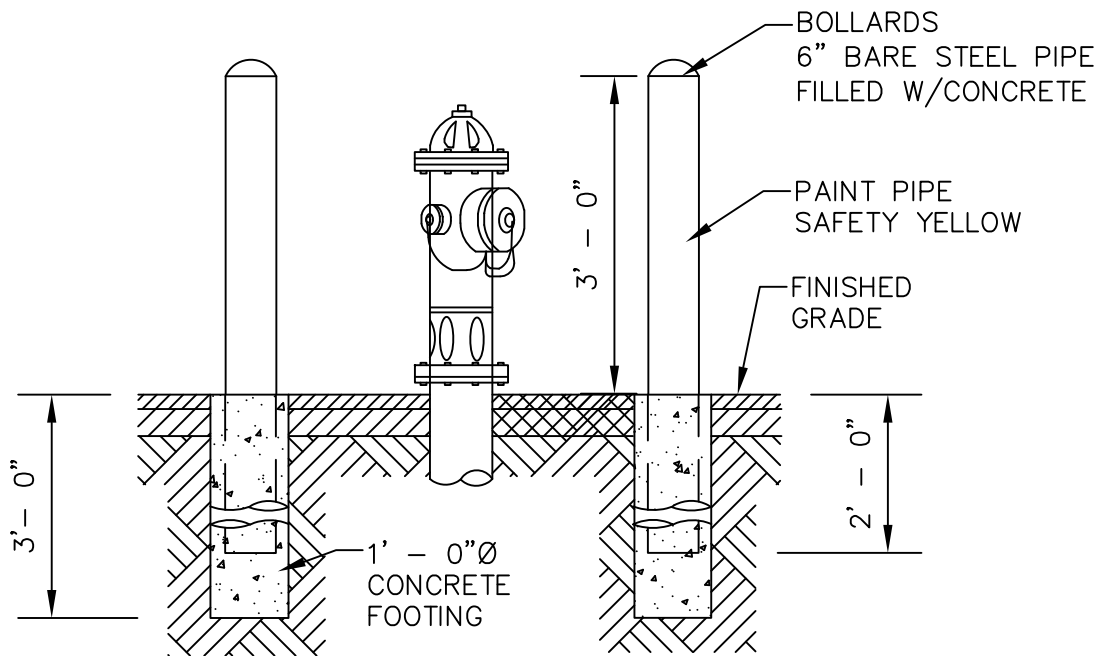
CONCRETE ANCHOR BLOCK

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021
REVISION DATE
CSAB-1
PAGE 20



TYPICAL 3 BOLLARD PLACEMENT –PLAN



ELEVATION

NOTES:

1. BOLLARDS SHALL BE THREE(3) FEET MINIMUM FROM THE FACE OF FIRE HYDRANT. ALL ORIFICES SHALL BE UNOBSTRUCTED.
2. QUANTITY & PLACEMENT OF BOLLARDS TO BE DETERMINED BY PLANS OR FIELD INSPECTION AS WARRANTED.
3. CONCRETE TO BE VDOT CLASS A3.

HYDRANT BOLLARDS

06/21/2021

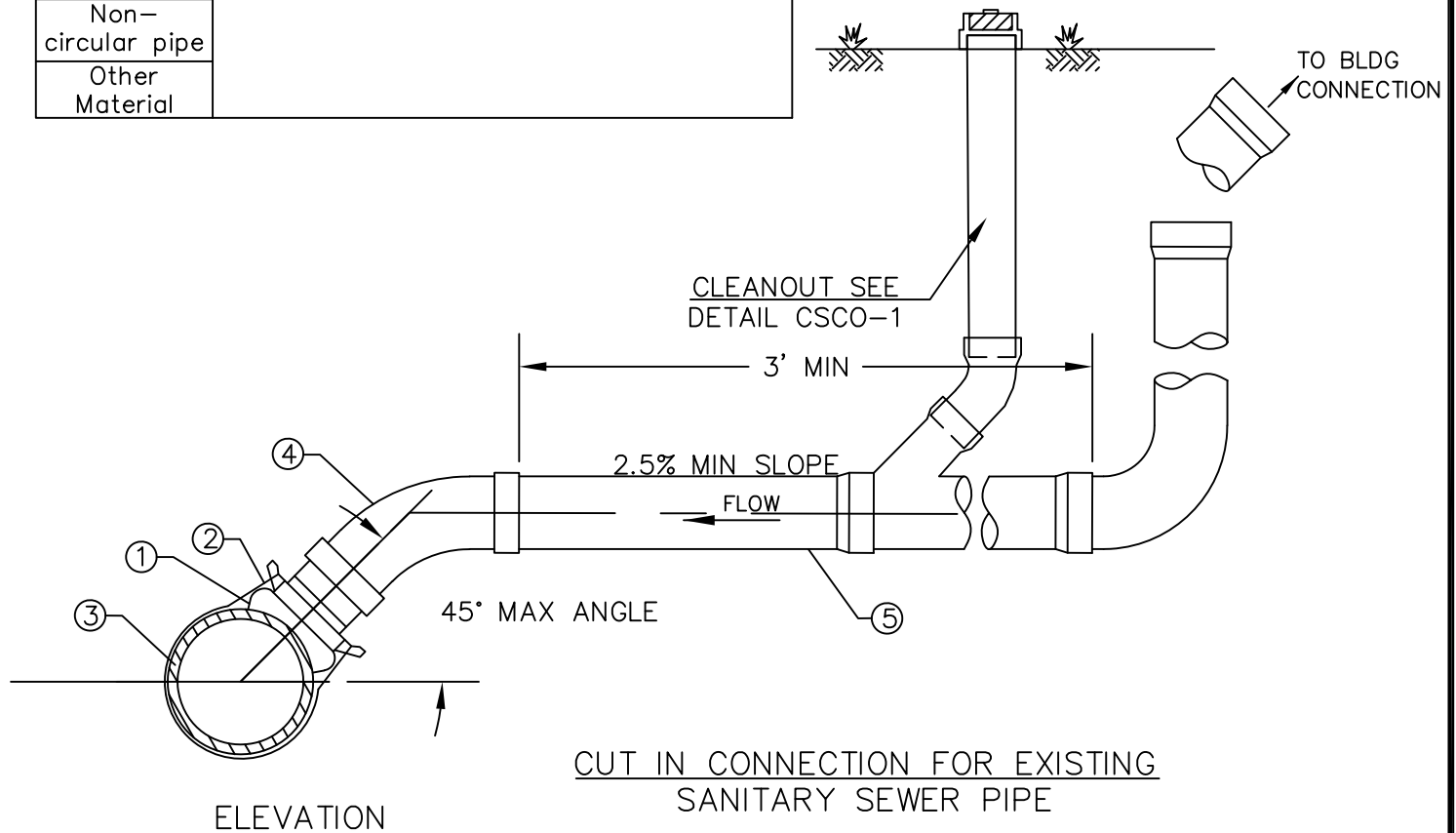
REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSHB-1

PAGE 21

Pipe Type	Pipe Cutting Method	Connection Type	Applicable Detail
PVC (SDR-26) or Schedule 40	Tapping Machine	Romac CB Sewer Saddle or approved equal	CSLC-1A
Concrete	Coring	Romac CB Sewer Saddle or approved equal	CSLC-1A
Cast Iron/Ductile Iron	Tapping Machine	Romac CB Sewer Saddle or approved equal	CSLC-1A
Vitrified Clay Pipe (VCP)	Saw Cut	Manufactured Y or T connection	CSLC-1B
Brick	Special design		
Non-circular pipe			
Other Material			



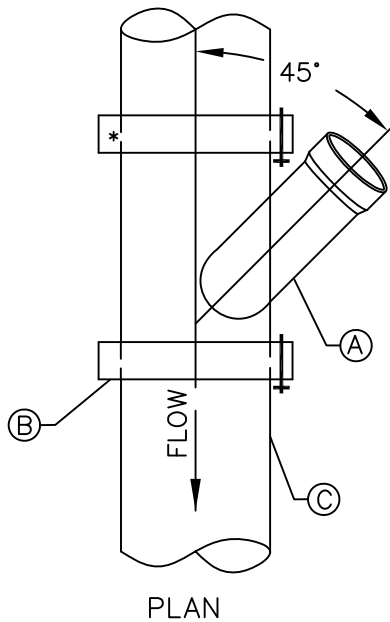
NOTE:

1. ROMAC CB SEWER SADDLE OR CITY APPROVED EQUAL
2. ROMAC CB STRAPS 304 STAINLESS STEEL
3. EXISTING SEWER MAIN
4. 45° ELBOW/ BEND
5. PVC LATERAL SDR 26 OR SCHEDULE 40

SANITARY SEWER LATERAL CONNECTION

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

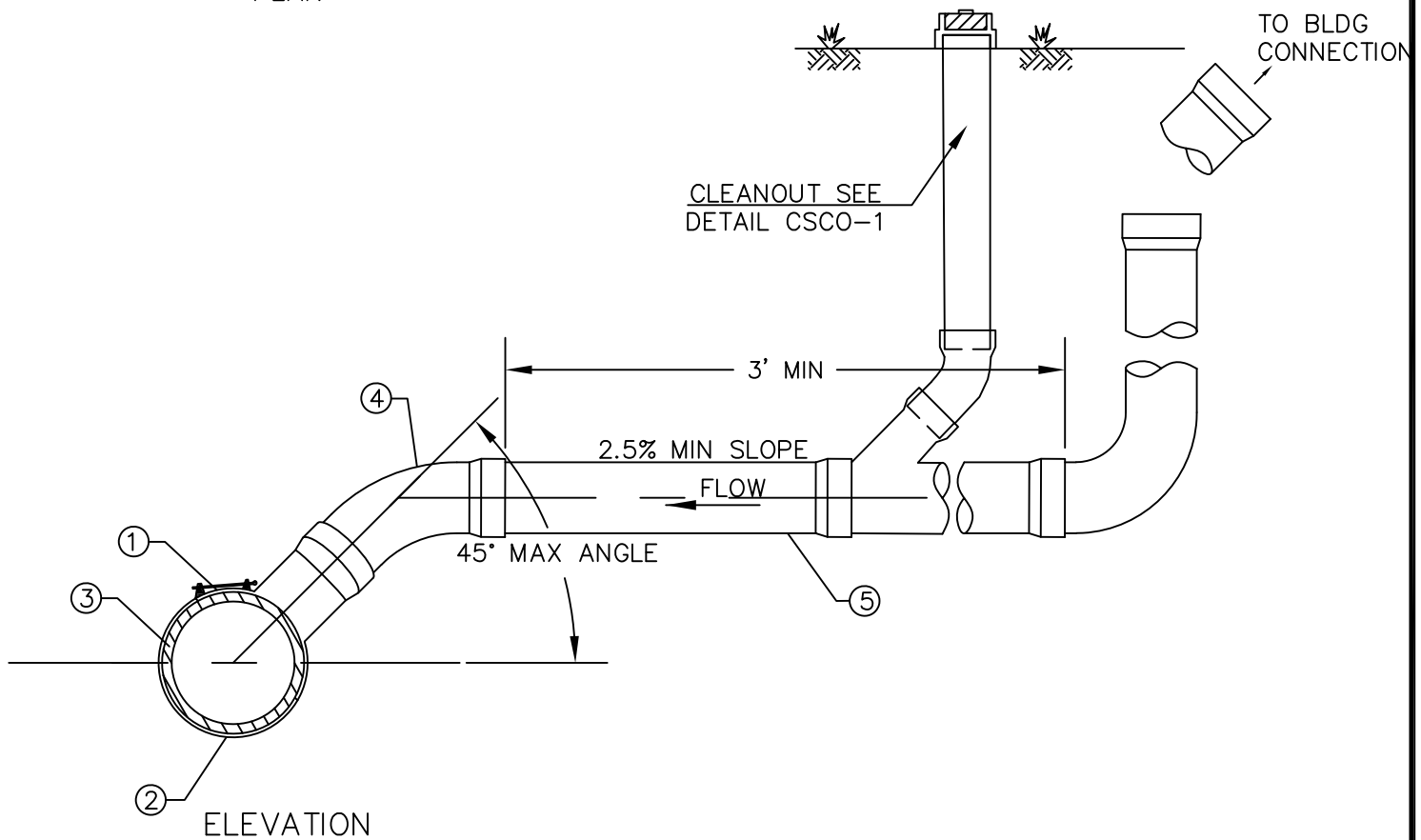
06/21/2021	REVISION	DATE
CSLC-1A		
PAGE 22		



NOTE:

1. STANDARD MANUFACTURED WYE OR TEE SECTION
2. HYMAX COUPLER OR FLANGED ADAPTERS OR CITY APPROVED EQUAL
3. EXISTING SANITARY SEWER
4. 45° ELBOW/ BEND
5. PVC LATERAL SDR 26 OR SCHEDULE 40

* EACH JOINT SPACE/ BETWEEN THE EXISTING PIPE AND THE INSERTED SECTION SHALL NOT EXCEED ONE (1) INCH.



MANUFACTURED WYE OR TEE CONNECTION FOR EXISTING VITRIFIED CLAY PIPE (VCP)
OR REPLACING ENTIRE SECTION OF OTHER MATERIALS PIPES

SANITARY SEWER LATERAL CONNECTION

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021
REVISION DATE
CSLC-1B
PAGE 23

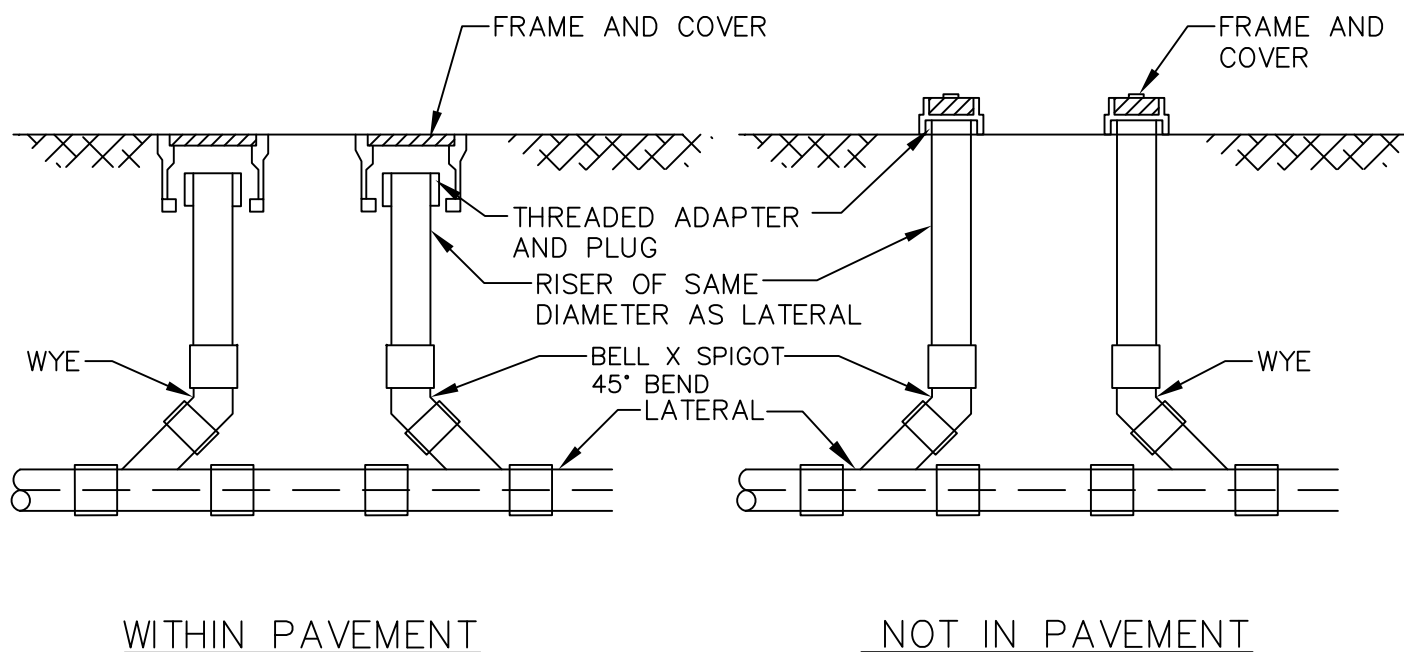
NOTES:

- A. CONNECTION TO A PUBLIC SANITARY SEWER SHALL REQUIRE A SEWER LATERAL CONNECTION PERMIT FROM THE DEPARTMENT OF TRANSPORTATION AND ENVIRONMENTAL SERVICES (T&ES). IF THE SANITARY SEWER IS LOCATED WITHIN THE PUBLIC RIGHT OF WAY AN EXCAVATION PERMIT SHALL ALSO BE REQUIRED.
- B. THE CONNECTION SHALL BE MADE PER THE RECOMMENDATIONS OF THE MANUFACTURER, AND IN THE PRESENCE OR WITH THE APPROVAL OF THE T&ES, CONSTRUCTION AND INSPECTION (C&I) INSPECTOR.
- C. THE SADDLE SHALL PROPERLY MATCH THE SANITARY SEWER MAIN PIPE.
- D. THE CUT ON THE EXISTING PIPE MUST BE NO LARGER THAN NECESSARY TO INSTALL SADDLE.
- E. ROUGH EDGES LEFT BY SAW CUT OR CORING SHALL BE SMOOTHED WITH A FILE OR SAND PAPER DEPENDING UPON THE MATERIAL OF THE SANITARY SEWER PIPE.
- F. OVER CUTTING THE HOLE OR DAMAGING THE SEWER MAIN WILL WARRANT REPLACEMENT OF THE DAMAGED MAIN LINE SEGMENT AND INSTALLATION OF A FACTORY MANUFACTURED WYE OR TEE CONNECTION PER DETAIL CSLC-1B.
- G. THE SADDLE CONNECTION MAY BE REPLACED WITH COMPRESSION SLEEVE CONNECTION WITH APPROVAL OF T&ES ENGINEER.
- H. THE TAP MUST BE OFFSET MINIMUM 2' FROM THE JOINTS.
- I. THE MANUFACTURED WYE OR TEE CONNECTION SHALL BE INSTALLED BY CUTTING OUT A SECTION OF VCP SEWER MAIN, MAINTAINING SQUARE ENDS, AND INSERTING THE MANUFACTURED WYE OR TEE SECTION. THE JOINTS ON BOTH SIDES SHALL BE SEALED USING HYMAX COUPLERS OR HYMAX FLANGED ADAPTERS OR CITY APPROVED EQUAL.
- J. T&ES INSPECTOR MUST INSPECT THE TAP PRIOR TO BACKFILL.
- K. ALL NEW INSTALLATIONS AND/OR REINSTALLATIONS OF SANITARY LINES AND SEWER LATERALS BOTH ON PRIVATE PROPERTY AND IN THE PUBLIC RIGHT OF WAY IN THE CITY OF ALEXANDRIA SHALL BE PROVIDED WITH 3" AND 6" WIDE 5 ML OVERALL THICKNESS DETECTABLE UNDERGROUND WARNING TAPES (DUWT).THE 3" DUWT SHALL BE INSTALLED AT DEPTHS OF 12" TO 18" AND 6" WIDE AT A DEPTH OF 24" SO AS TO MAKE UNDERGROUND INSTALLATIONS EASY TO FIND USING A NON-FERROUS LOCATOR. THE DUWT SHALL BE WITH ALUMINUM BACKING OR SOLID ALUMINUM CORE LAMINATED WITH A PROTECTIVE CLEAR FILM ON BOTH SIDES SEALING AND PROTECTING THE GRAPHICS FROM UNDERGROUND MOISTURE ACIDS, ALKALIS, AND OTHER SOIL SUBSTANCES. ALL DUWT TAPES SHALL BE PRINTED IN BLACK INK ON AMERICAN PUBLIC WORKS ASSOCIATION (APWA) APPROVED COLORS TO MEET OR EXCEED INDUSTRY STANDARDS. THE APPROVED COLOR FOR SANITARY SEWER LINES AND LATERALS IS GREEN.
- L. BEDDING SHOULD BE AS PER (CSTB-1).
- M. SEE CSCO-1 FOR CLEANOUT DETAIL.
- N. FOR PIPE MATERIAL TABLE SEE DETAIL CSLC-1A.

SANITARY SEWER LATERAL CONNECTION NOTES

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021	
REVISION	DATE
CSLC-1C	
PAGE 24	



NOTE:

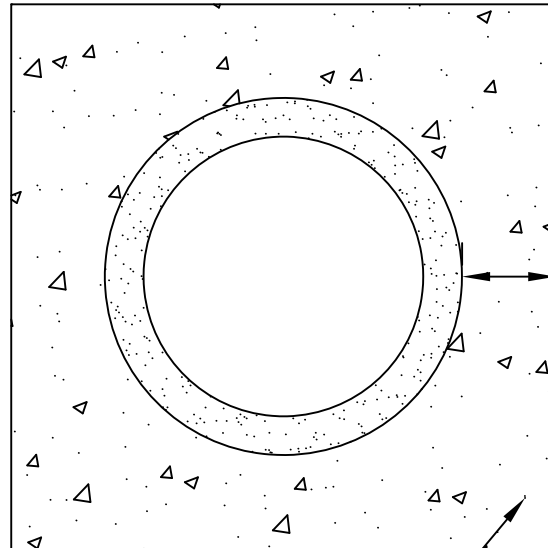
1. TERMINATE TRACER WIRE WITH CLEANOUT THAT IS WITHIN 5" OF BUILDING'S EXTERIOR. TERMINATE TRACER WIRE ABOVE GRADE IN AN ACCESSIBLE LOCATION. WHERE PROJECTED FROM DAMAGE. IF NOT USING IRON FRAME AND COVER.
2. TRACER WIRE TO BE #12 AWG SOLID COPPER WITH 45 MIL POLYETHYLENE INSULATION. AT TEMPORARY TERMINATION OF LATERAL BY UTILITY CONTRACTOR, MAKE SPLICE WITH BUTT CONNECTOR AND SHRINK SLEEVE. NO OTHER SPLICES PERMITTED.
3. EXPOSED CONCRETE TO HAVE CHAMFERED EDGES.

SANITARY SEWER CLEANOUT

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

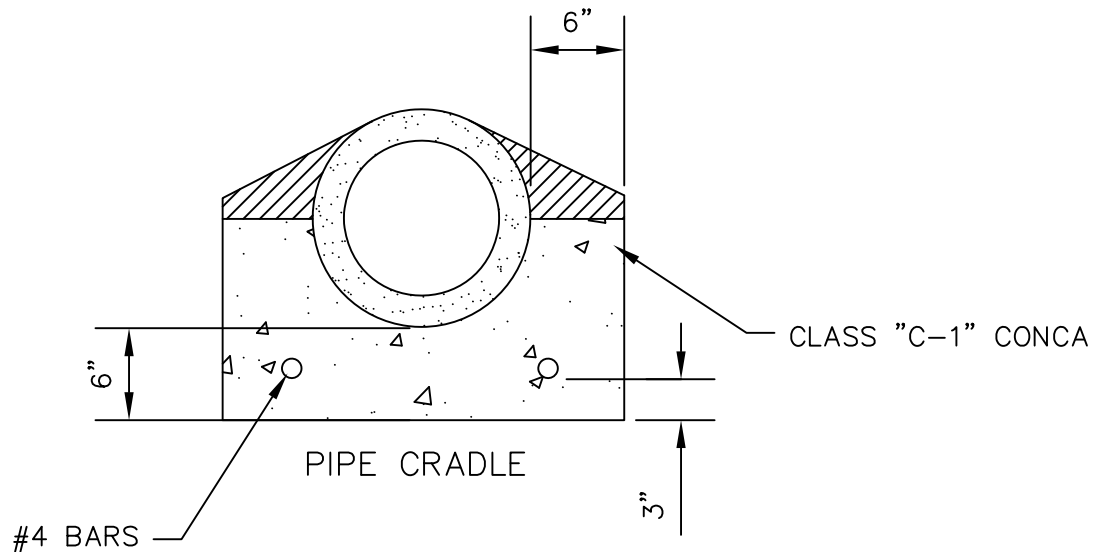
06/21/2021	REVISION	DATE
CSCO-1		
PAGE 25		

PIPE ENCASEMENT



6" MIN.
ALL SIDES

CLASS "C-1" CONCRETE
ENCASEMENT
(WHEN REQUIRED)



NOTE:

1. MINIMUM REQUIRED FOR UNCONTROLLED FILL AND UNACCEPTABLE NATIVE SOILS. GEOTECHNICAL ANALYSIS REQUIRED FOR OTHER CONDITIONS.
2. ENCASEMENT TO BE ONLY FOR SHALLOW COVER \leq 2 FEET.

SEWER PIPE ENCASEMENT AND HIGH CRADLE

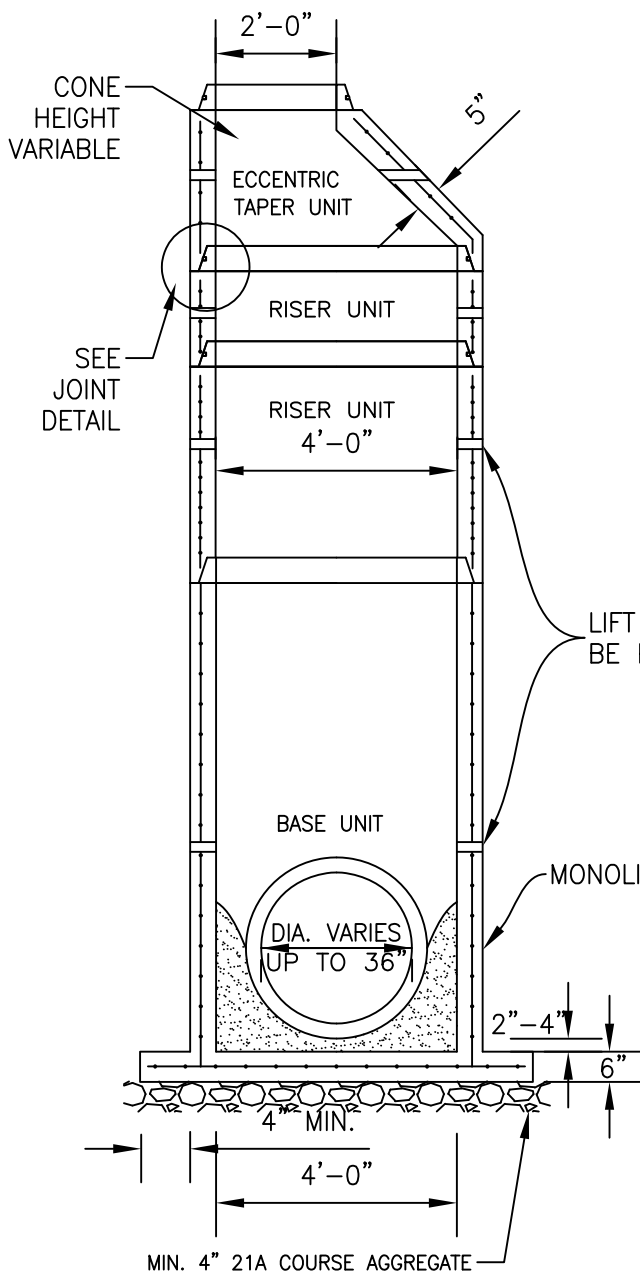
DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021

REVISION DATE

CSSE-1

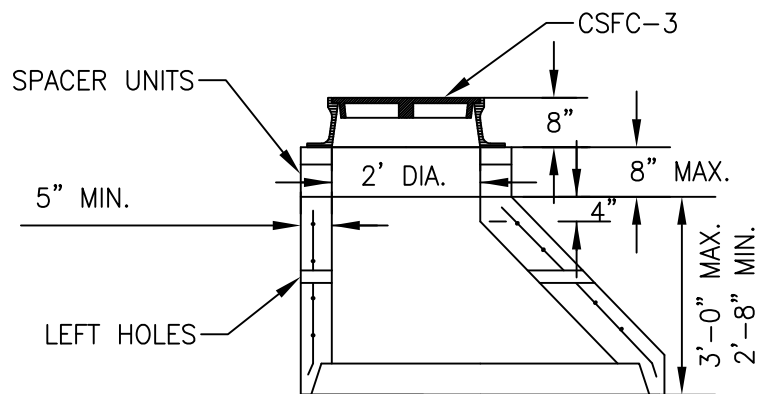
PAGE 26



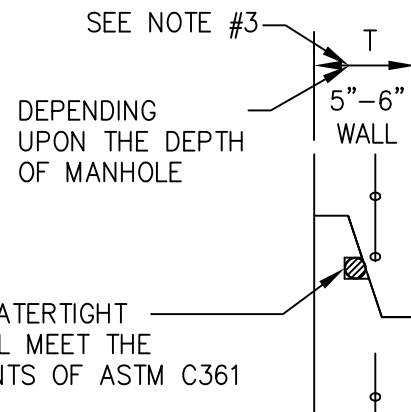
N.T.S.

NOTE:

1. THE MANHOLE SHALL BE DESIGNED TO MEET HS-20 LOADING CAPACITY.
2. PIPE MUST BE FLUSH WITH INSIDE WALL OF MANHOLE.
3. WALLS TO DEPTH OF 12' TO BE 5" THICK.
WALLS DEEPER THAN 12' TO BE 6".



ECCENTRIC TOP UNIT DETAIL



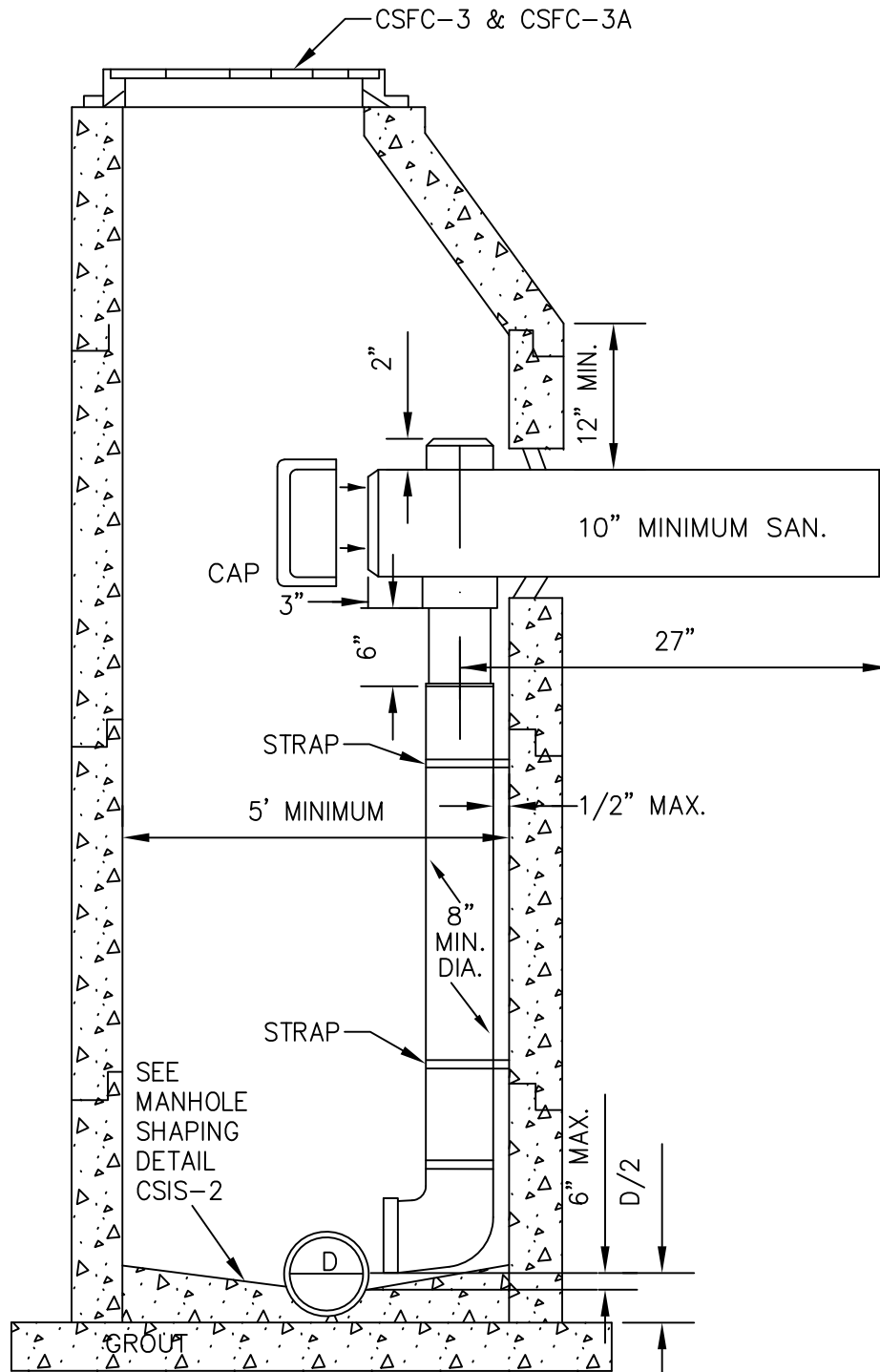
4. THE MINIMUM DIFFERENCE BETWEEN THE UPSTREAM AND DOWNSTREAM INVERTS SHOULD BE 0.1 FEET.
5. PROVIDE TONGUE AND GROOVE JOINTS IN MANHOLE SECTIONS WITH A PREFORMED GROOVE IN THE TONGUE FOR PLACEMENT OF AN O-RING TYPE ROUND, RUBBER GASKET, OR FOR PLACEMENT OF A PRESS SEAL TYPE 4-G MANHOLE GASKET IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM C361.
 - a. GASKET SHALL COMPLY WITH REQUIREMENTS OF ASTM C361.
 - b. GASKET SHALL PROVIDE THE SOLE ELEMENT IN SEALING THE JOINT FROM EITHER INTERNAL OR EXTERNAL HYDROSTATIC PRESSURE.
6. MANHOLE SHALL BE TESTED FOR NEGATIVE AIR PRESSURE (VACUUM) TEST IN ACCORDANCE WITH ASTM C1244 FOR THE FINAL ACCEPTANCE.
7. WHEN A WATERTIGHT FRAME AND COVER IS REQUIRED BY THE CITY, A CSFC-4 SHALL BE USED.
8. FOR MANHOLES OVER 60" IN DIAMETER, A SPECIAL DESIGN WILL BE SUBMITTED TO CITY FOR APPROVAL.
9. FOR REINFORCEMENT SCHEDULE SEE CSMH-2, PAGE 11.

PRECAST MANHOLE

4' INSIDE DIAMETER; FOR PIPES UP TO 36" IN DIAMETER

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021
REVISION DATE
CSMH-3
PAGE 27



MANHOLE (Drop)

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021	REVISION	DATE
CSMH-4		
PAGE 28		

NOTES:

1. WHEN IT IS NECESSARY TO DROP THE ELEVATION OF THE SEWER AT A MANHOLE DUE TO UNUSUAL CIRCUMSTANCES SUCH AS BAD SOIL, ROCK, HIGH WATER TABLE, UTILITY CONFLICTS OR EXCESSIVE DEPTHS, DROP CONNECTION IS REQUIRED. ANY DROP CONNECTION FOR A SEWER LINE DIAMETER OF 15" OR GREATER SHALL REQUIRE A SPECIAL DESIGN TO BE APPROVED BY T&ES. THE MAXIMUM DIFFERENCE IN ELEVATION PERMITTED BETWEEN THE INFLUENT AND EFFLUENT LINES IN A STANDARD MANHOLE WILL BE 2'-0".
2. ALL THROUGH PIPE SHALL BE FILLED WITH AN SDR 35 PVC SOLVENT WELD CAP THAT SHALL BE HELD IN PLACE BY THE INTERFACE FIT BETWEEN THE PIPE AND CAP.
3. ALL CAPS SHALL BE SECURED TO THE DROP FITTING WITH 2' OF GALVANIZED CHAIN SECURED WITH 2 STEEL MACHINE SCREWS, NUTS AND WASHERS.
4. CHAMFER ON ALL PIPE SIZES TO BE AT A 45° ANGLE.
5. VERTICAL STACK TO BE SDR 35 PVC PIPE CONNECTED TO DROP FITTING WITH STANDARD COUPLING AND SOLVENT WELD.
6. VERTICAL STACK WILL BE STRAPPED TO MANHOLE AT THE JOINT WHEN MORE THAN 1 SECTION OF PIPE IS USED. STRAP TO BE MADE OF MATERIAL NONCORROSIVE TO SEWER GASES.
7. ELBOW AT BOTTOM OF THE STACK WILL BE EITHER A 45° OR 90° TURN MADE OF SDR 35 PVC PIPE PLACED IN THE DIRECTION OF THE FLOW IN MANHOLE, WITH BENCH CONSTRUCTED TO CONFORM TO MANHOLE BENCH.
8. WHEN PIPE MATERIAL IS OTHER THAN PVC, A FULL CIRCLE CLAMP COUPLING WILL BE USED AT THE INTERSECTION OF THE INCOMING MAIN TO THE PVC INSIDE DROP FITTING. THE LENGTH OF THIS COUPLING SHALL NOT BE LESS THAN THE SIZE OF THE NOMINAL PIPE DIAMETER ON WHICH IT IS BEING USED.
9. ADDITIONAL DROPS WILL REQUIRE A LARGER DIAMETER MANHOLE.
10. STAINLESS STEEL STRAPPING SHALL BE 1" WIDE BY 1/8" THICK AND ATTACHED TO THE MANHOLE WALL WITH MASONRY ANCHORS.
11. THE MANHOLE SHALL BE DESIGNED TO MEET HS-20 LOADING CAPACITY.
12. EXTERNAL DROPS ARE NOT ALLOWED.

MANHOLE (Drop) NOTES

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021

REVISION DATE

CSMH-4A

PAGE 29

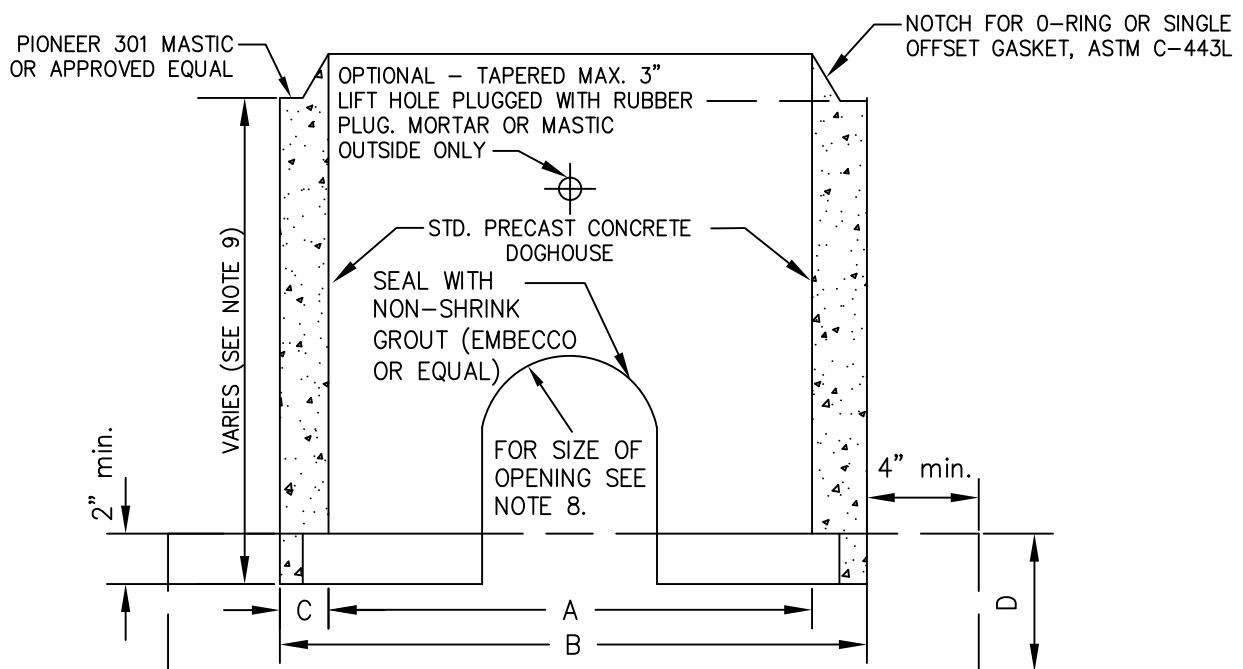
NOTE:

1. CONCRETE TO BE VDOT CLASS A-4.
2. ALL REINFORCING STEEL TO MEET THE CURRENT REQUIREMENTS OF ASTM SPEC. A-615.
3. MANHOLE SECTIONS TO MEET THE CURRENT REQUIREMENTS OF ASTM SPEC. C-478.
4. TAPERED JOINT WITH O-RING GASKET, OR SINGLE OFFSET JOINT WITH RUBBER GASKET TO MEET CURRENT REQUIREMENTS OF ASTM SPEC. C-443.
5. DOGHOUSE OPENING MAY ONLY BE USED WHEN PLACING A NEW MH OVER AN EXISTING LINE; OTHERWISE, THE OPENING MUST BE CAST. SIZE, LOCATION & ANGLE OF ENTRY MUST BE AS REQUIRED BY THE PLANS.
6. MH SECTION TO BE CAST IN THE BASE A MIN. OF 2".
7. JOINT CONFIGURATION MAY BE CAST BELL-UP OR SPIGOT-UP.
8. HOLES IN PRECAST UNITS ARE TO BE 4" MIN. 8" MAX. LARGER THAN THE OUTSIDE DIA. OR THE PROPOSED PIPE.
9. BASE SECTION TO PROVIDE MIN. 6" CLEARANCE BETWEEN TOP OF PIPE OPENING AND BOTTOM OF BELL AND SPIGOT JOINT.
10. THE MANHOLE SHALL BE DESIGNED TO MEET HS-20 LOADING CAPACITY.

CHART "A"

MIN. DIMENSIONS (in.)			
MH	4' - 0"	5' - 0"	6' - 0"
A	48"	60"	72"
B	58"	72"	86"
C	5"	6"	7"
D	6"	8"	10"

DIMENSIONS OF D MUST BE TAKEN FROM BOTTOM OF KEY (SEE DRAWING BELOW)



DOGHOUSE MANHOLE

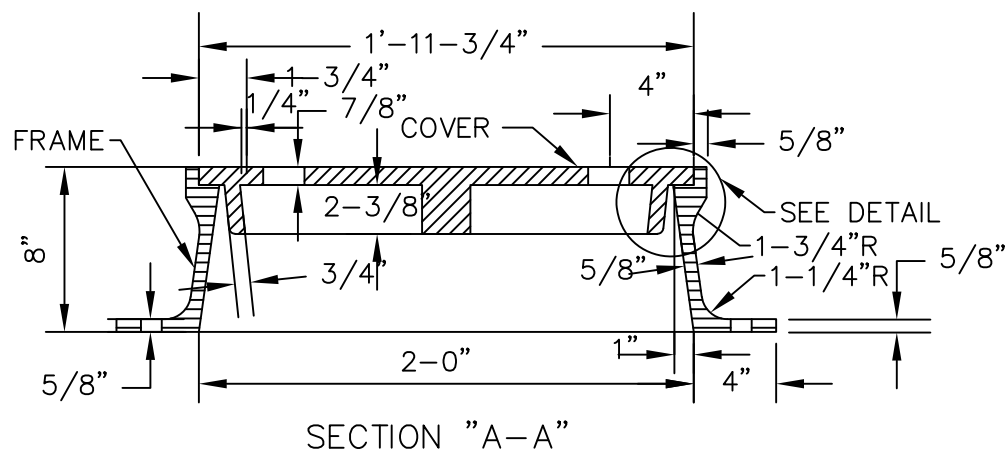
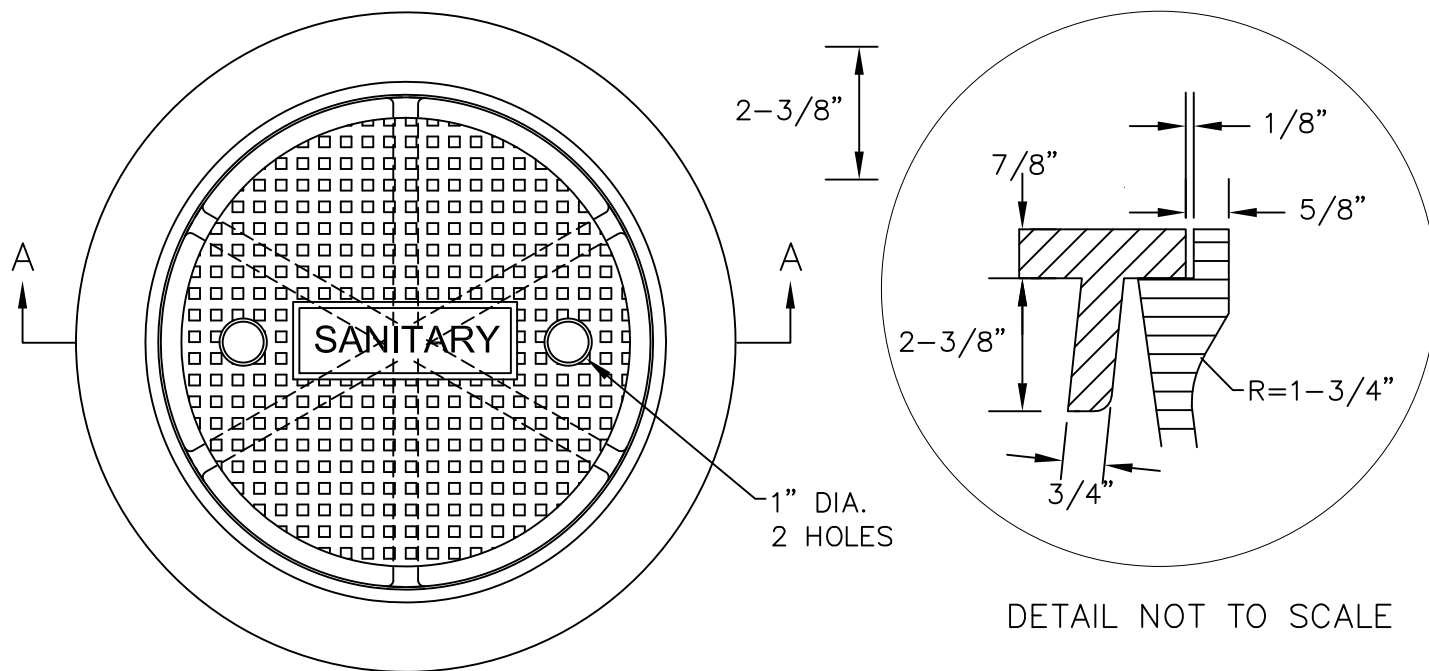
06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSMH-5

PAGE 30



NOTE: THE MANHOLE FRAME AND COVER SHALL BE DESIGNED TO MEET HS-20 LOADING CAPACITY.

NOTE :

TOP AND CASTING TO BE MACHINED.

FRAME WEIGHT 200 LBS.

COVER WEIGHT 125 LBS.

TOTAL WEIGHT 325 LBS.

MANHOLE FRAME & COVER

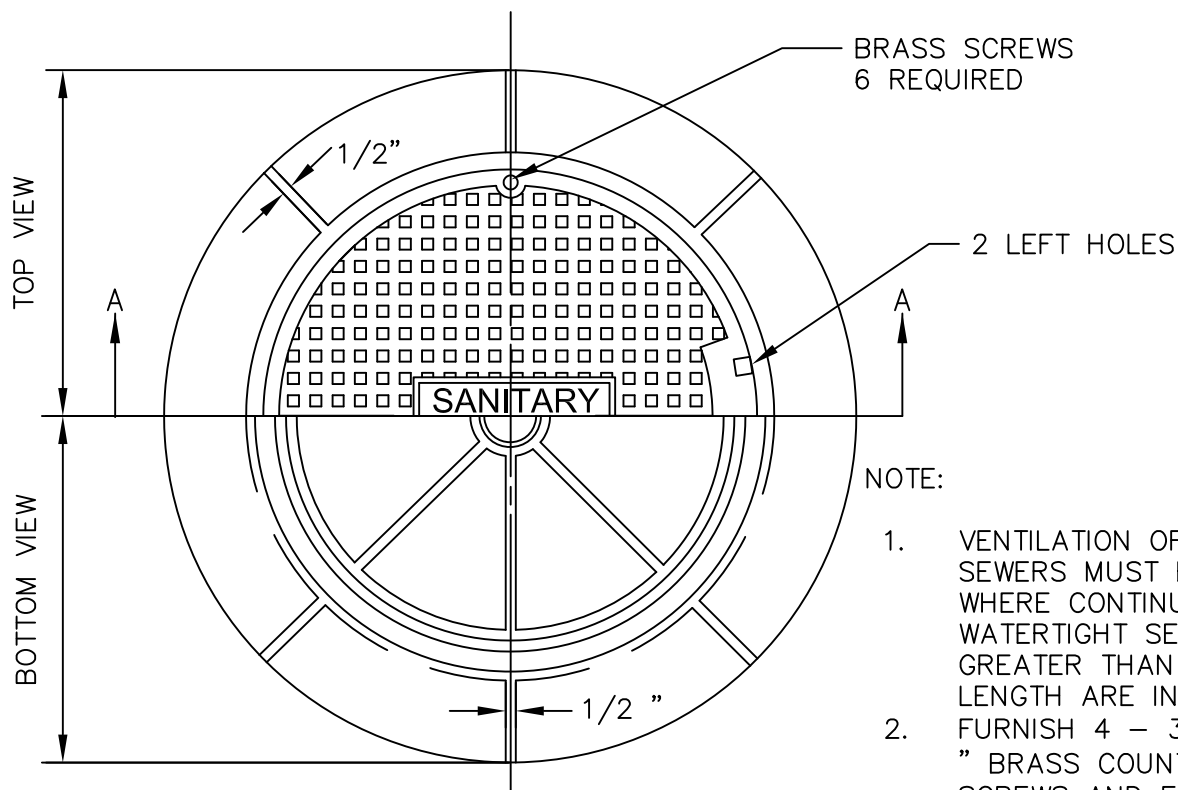
06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSFC-3

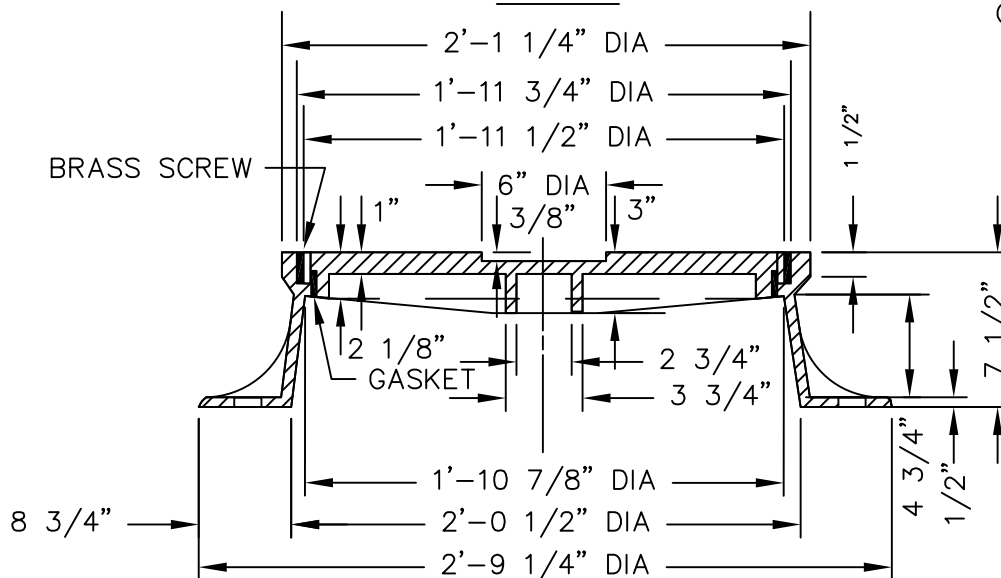
PAGE 31



NOTE:

1. VENTILATION OF GRAVITY SEWERS MUST BE PROVIDED WHERE CONTINUOUS WATERTIGHT SECTIONS GREATER THAN 1000 FEET IN LENGTH ARE INCURRED.
2. FURNISH 4 - 3/8" x 2 1/2" BRASS COUNTERSUNK CAP SCREWS AND FLEXIBLE PLASTIC GASKET BETWEEN COVER AND FRAME SET.

PLAN



SECTION A-A

NOT TO SCALE

MINIMUM AVG. WEIGHTS	
FRAME	190 LBS
COVER	120 LBS
TOTAL	310 LBS

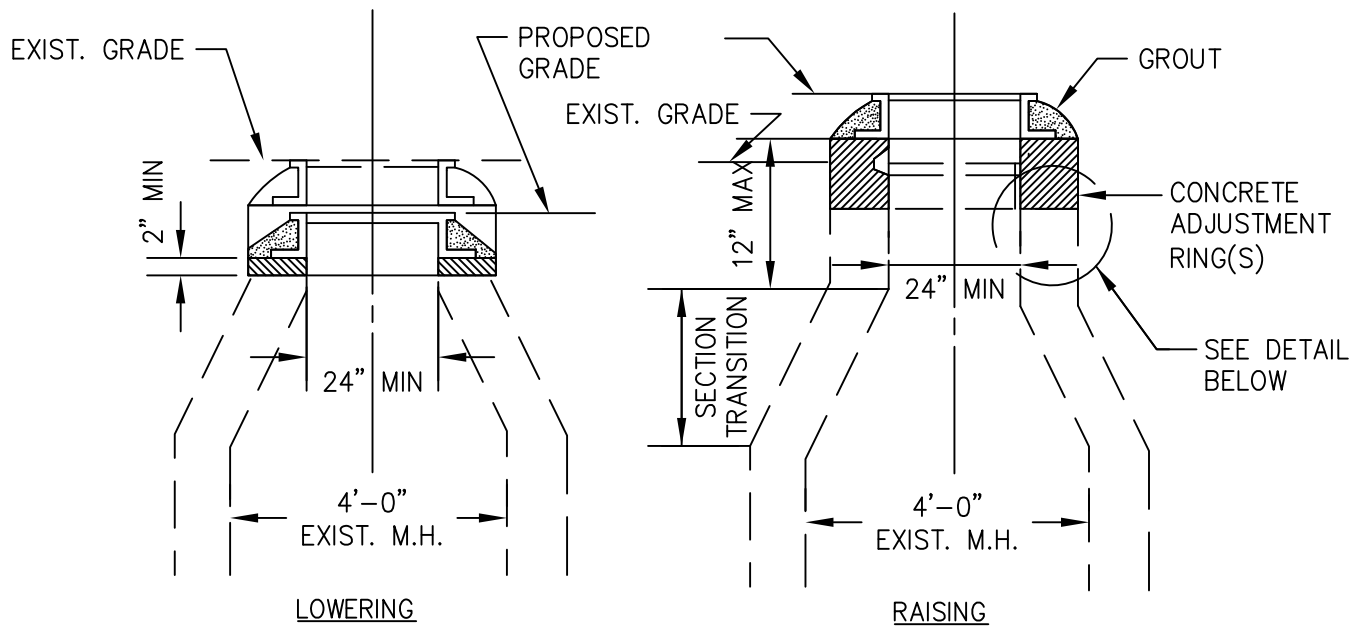
NOTE: THE MANHOLE FRAME AND COVER SHALL BE DESIGNED TO MEET HS-20 LOADING CAPACITY.

MANHOLE FRAME & COVER

(Bolted - Watertight)

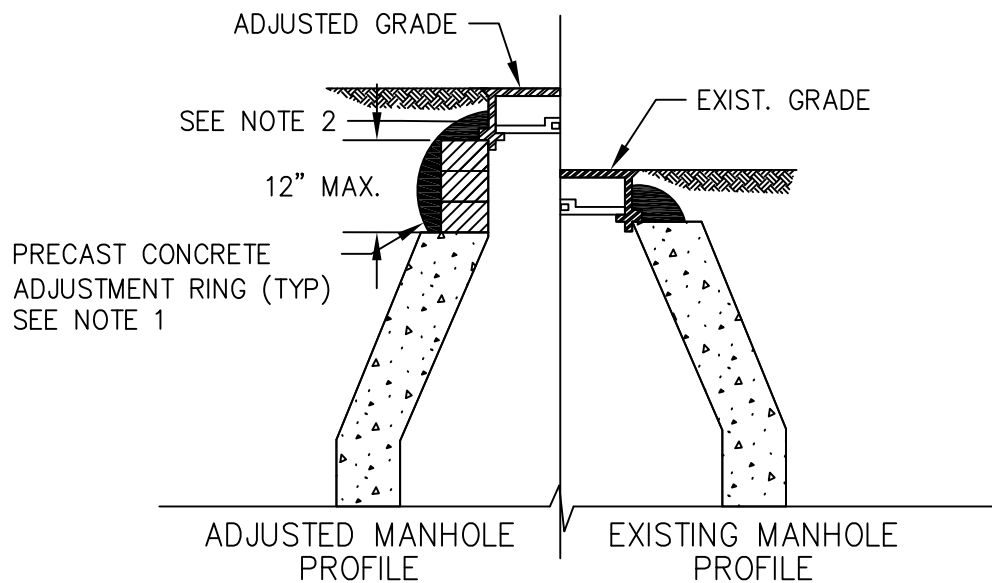
DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021	REVISION	DATE
CSFC-4		
PAGE 32		



ADJUSTMENT (FRAME & COVER ONLY)

RAISE OR LOWER FRAME AND COVER SUCH THAT HEIGHT OF 24" NECK SECTION, INCLUDING FRAME AND COVER, DOES NOT EXCEED 12" MAXIMUM OR 2" MINIMUM. IF RANGE IS EXCEEDED, USE MODIFIED MANHOLE ADJUSTMENT.

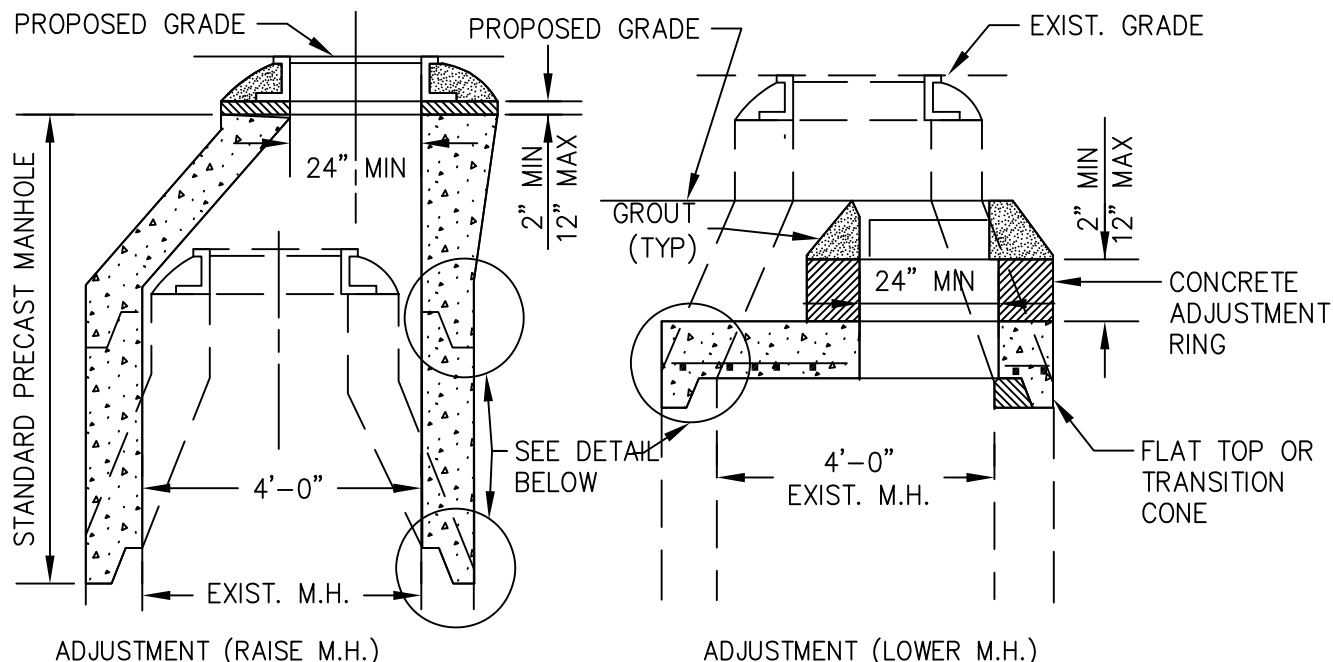


SEE NOTES ON MODIFIED MANHOLE ADJUSTMENT DETAIL, CSMA-1A.

MANHOLE (Grade Rim Adjustments)

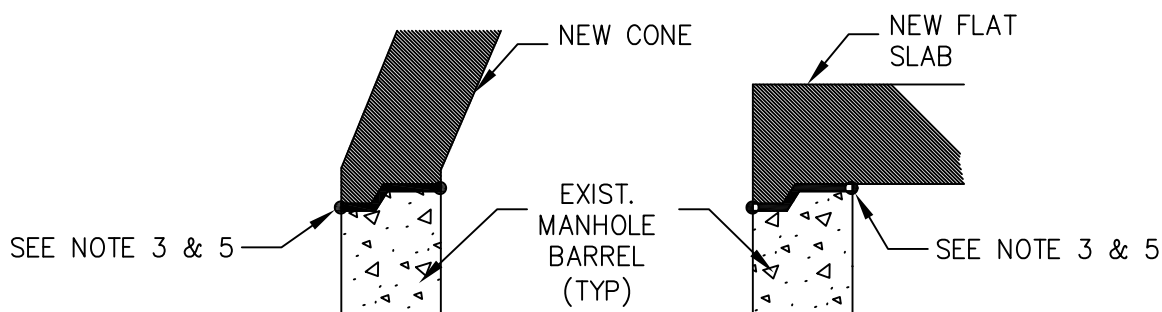
DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021	REVISION	DATE
CSMA-1		
PAGE 33		



REMOVE EXISTING TRANSITION SECTION AND
CONSTRUCT NEW MANHOLE AS REQUIRED

REMOVE EXISTING TRANSITION SECTION AND
MANHOLE TO 2' MIN. BELOW PROPOSED GRADE AND
CONSTRUCT NEW MANHOLE AS REQUIRED.



NOTES:

1. RINGS TO BE COATED ON ALL INTERIOR SURFACES, 3/8" THICK (MIN) WITH HYDRAULIC CEMENT HIGH STRENGTH GROUT.
2. MH CASTING (FRAME) AND PRECAST CONCRETE ADJUSTMENT RINGS TO BE SET AND EMBEDDED IN BUTYL JOINT MATERIAL ("RAM-NEK" OR EQUAL) AND CAPPED WITH HIGH STRENGTH HYDRAULIC CEMENT GROUT OVER FRAME FLANGE, ADJUSTMENT RINGS AND CONE OR BARREL SECTION.
3. BUTYL JOINT MATERIAL TO BE PLACED OVER ENTIRE SURFACE OF JOINT AND SQUEEZED OUT WHEN JOINT IS MADE. STRIKE EXCESS FLUSH WITH JOINT BEFORE APPLYING GROUT.
4. NEW MH SECTION TO BE SET AND EMBEDDED IN BUTYL JOINT MATERIAL ("RAM-NEK" OR EQUAL).
5. CLEAN AND PATCH EXISTING BARREL SURFACE, PLACE BUTYL JOINT MATERIAL OVER ENTIRE SURFACE (TOP SHOULDER, SLOPE AND SEAT) AND SQUEEZE OUT WHEN JOINT IS MADE.
6. THE CONTRACTOR SHALL RE-GROUT THE ENTIRE MANHOLE WHEN STRUCTURE IS RAISED OR LOWERED.

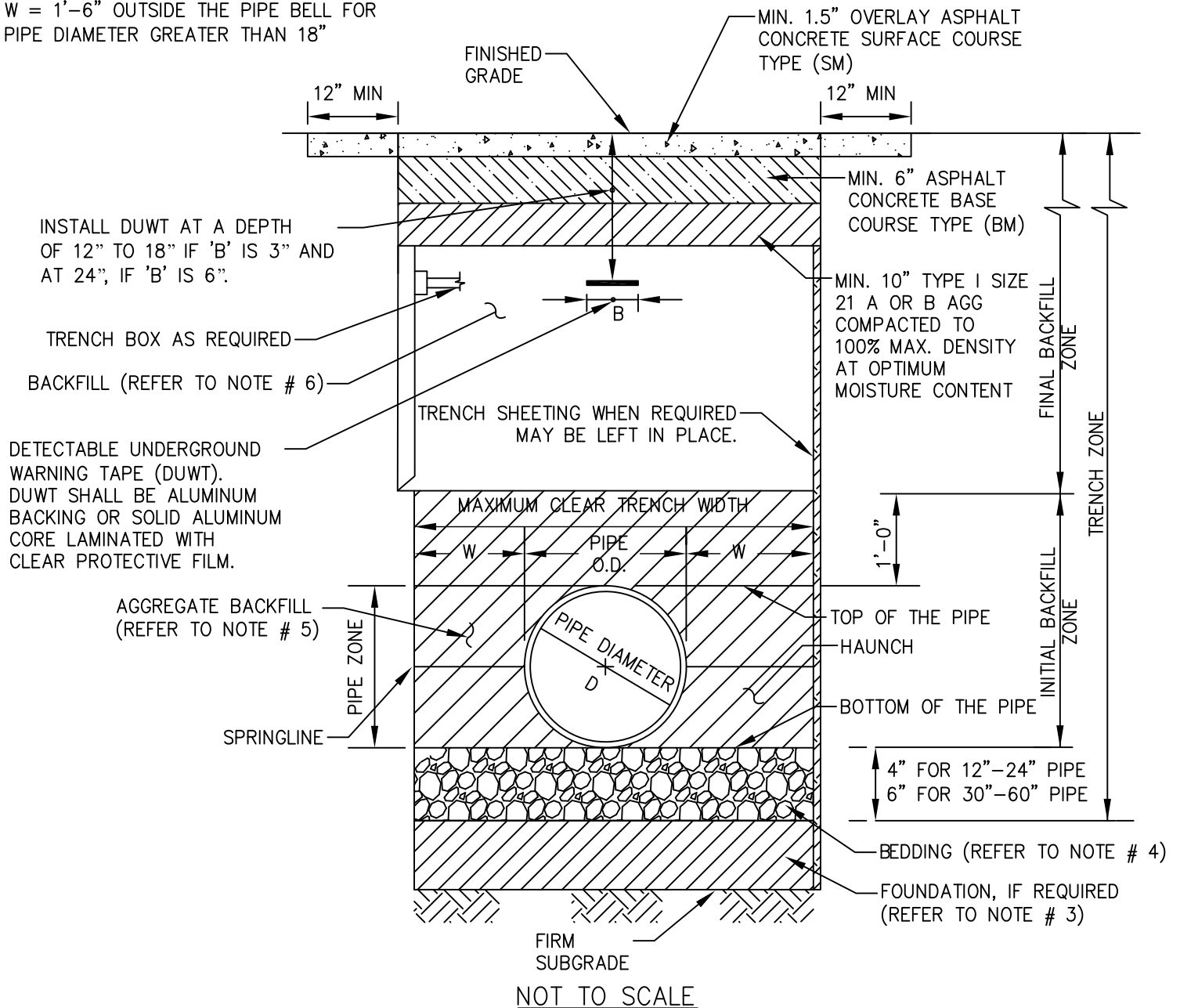
MODIFIED MANHOLE ADJUSTMENTS

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021	REVISION	DATE
CSMA-1A		
PAGE 34		

W = 1'-0" OUTSIDE THE PIPE BELL FOR
PIPE DIAMETER LESS THAN 18"

W = 1'-6" OUTSIDE THE PIPE BELL FOR
PIPE DIAMETER GREATER THAN 18"



NOTE:

- THE TRENCH WIDTH SHOULD NOT EXCEED THE PIPE OUTSIDE DIAMETER PLUS W.
- PAVEMENT RESTORATION IS 12 INCHES MINIMUM BEYOND THE EDGE OF THE TRENCH ON LONGITUDINAL OPEN CUTS, OR 25 FEET MINIMUM BEYOND THE TRENCH CENTERLINE ON PERPENDICULAR OPEN CUT, OR AS MENTIONED ON COA APPROVED PLANS.

**TRENCH BEDDING & BACKFILL DETAIL
FLEXIBLE / PVC PIPE**

06/21/2021
REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSTB-1
PAGE 35

NOTE:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT ASTM D2321 STANDARD, AS MODIFIED IN THIS DETAIL.
2. MINIMUM COVER FOR ALL H-25 LOADING APPLICATIONS SHALL BE 3'-6". MINIMUM COVER IS MEASURED FROM THE TOP OF PIPE TO THE TOP OF A RIGID PAVEMENT OR BOTTOM OF FLEXIBLE/ASPHALT PAVEMENT SECTIONS.
3. UNSTABLE TRENCH BOTTOM MATERIAL AND/OR ROCK SHALL BE EXCAVATED TO A DEPTH SPECIFIED BY THE ENGINEER AND SHALL BE REPLACED WITH CLASS I MATERIAL PER CURRENT ASTM D2321 STANDARD OR 21-A COMPACTED TO 95% OF THE MAXIMUM STANDARD PROCTOR DENSITY OR 90% OF THE MAXIMUM MODIFIED PROCTOR DENSITY. WHEN STANDING WATER IS IN PIPE FOUNDATION AREA, #57 STONE CAN BE USED AS A BACKFILL IN THE SUBFOUNDATION WITH THE CONDITION THAT #57 STONE SHALL BE CAPPED WITH A MINIMUM 4" CRUSHER RUN OR 21-A PRIOR TO PLACEMENT OF A PIPE (COMPACTION TESTING ON #57 STONE IS NOT REQUIRED; SEAT STONE IN TRENCH). FOR SEVERE CONDITIONS, THE ENGINEER MAY REQUIRE A SPECIAL FOUNDATION SUCH AS PILES OR SHEETING CAPPED WITH CONCRETE MAT. CONTROL OF QUICK AND UNSTABLE TRENCH BOTTOM CONDITIONS MAY BE ACCOMPLISHED WITH THE USE OF APPROPRIATE GEOFABRICS.
4. BEDDING MATERIAL SHALL BE CLASS I MATERIAL #26 AND #27 PER CURRENT ASTM D2321 STANDARD OR VDOT AGGREGATE #8 OR CRUSHER RUN AGGREGATE #25 OR #26 CONFORMING TO THE REQUIREMENTS OF SECTION 205 AND 302 OF VDOT ROAD AND BRIDGE SPECIFICATIONS. WORK MATERIAL UNDER PIPE TO PROVIDE HAUNCH SUPPORT.
5. INITIAL BACKFILL MATERIAL SHALL BE CLASS I MATERIAL PER CURRENT ASTM D2321 STANDARD OR VDOT AGGREGATE #8, #68, OR #78, OR CRUSHER RUN AGGREGATE #25 OR #26 CONFORMING TO THE REQUIREMENTS OF SECTION 205 OF VDOT ROAD AND BRIDGE SPECIFICATIONS; OR AGGREGATE BASE MATERIAL SIZE 21 A OR FLOWABLE FILL. THE BACKFILL SHALL BE INSTALLED IN LIFTS AND COMPACTED PER ASTM D2321, AS APPLICABLE. BACKFILL SHALL EXTEND TO NOT LESS THAN 1'-0" ABOVE THE TOP OF THE PIPE.
6. EXCAVATED MATERIAL BACKFILLED IN 6" LAYERS TO 95% COMPACTION. SELECT MATERIAL, WHERE CALLED FOR, MAY BE USED.
7. BACKFILL UNDER PAVED ROAD TO BE SELECT MATERIAL VDOT 21A.
8. SHEETING LEFT IN PLACE SHALL BE EITHER STEEL OF PRESSURE TREATED WOOD.

TRENCH BEDDING & BACKFILL DETAIL
NOTES FOR PVC

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021

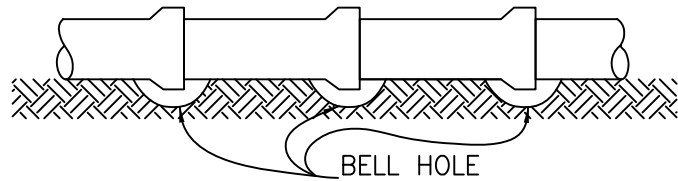
REVISION DATE

CSTB-1A

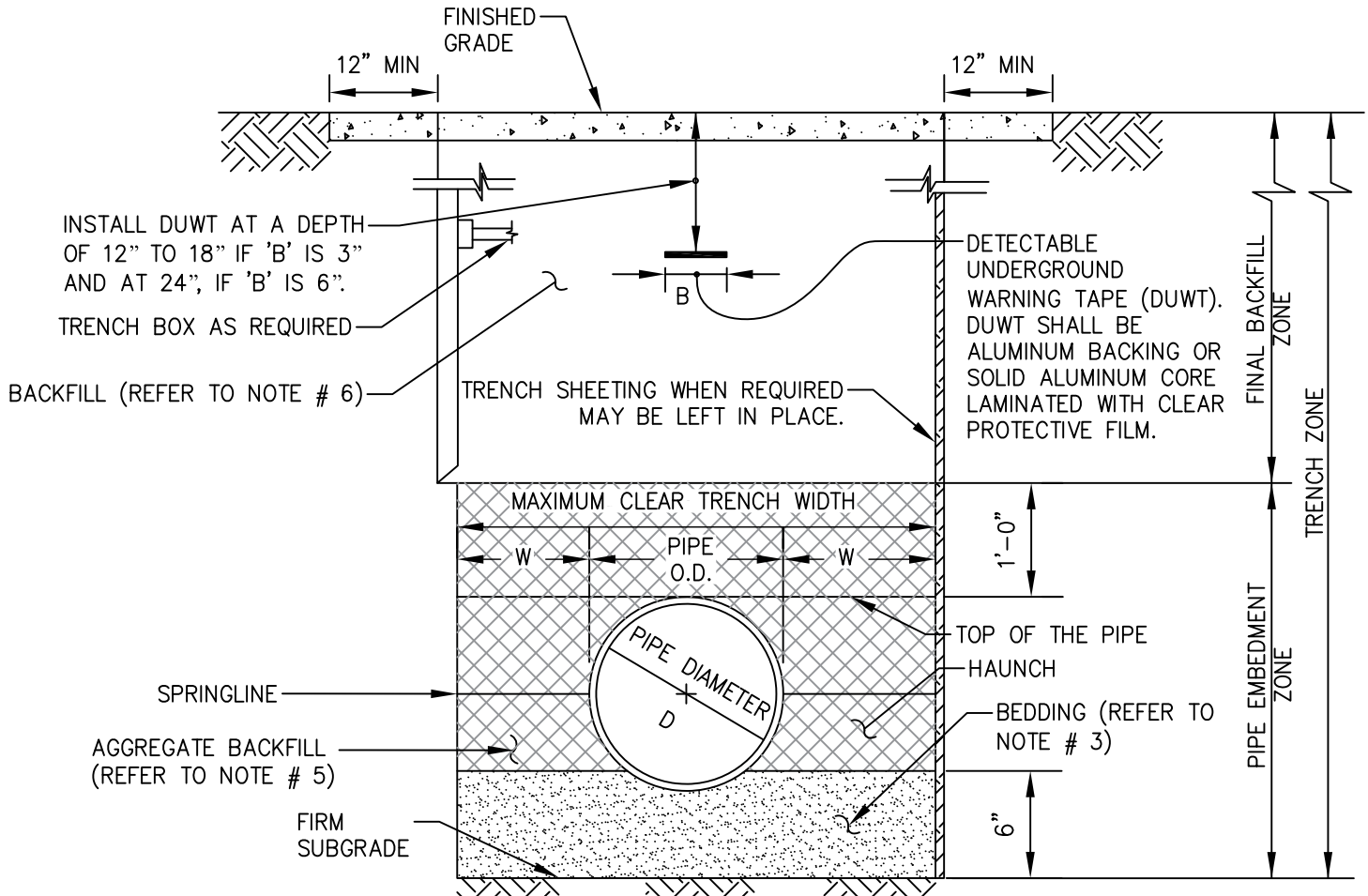
PAGE 36

W = 1'-0" OUTSIDE THE PIPE BELL FOR
PIPE DIAMETER LESS THAN 18"

W = 1'-6" OUTSIDE THE PIPE BELL FOR
PIPE DIAMETER GREATER THAN 18"



BELL HOLES SHALL BE EXCAVATED SO THAT THE PIPE IS
SUPPORTED BY THE BARREL AND NOT BY THE BELLS.



NOT TO SCALE

NOTE:

- THE TRENCH WIDTH SHOULD NOT EXCEED THE PIPE OUTSIDE DIAMETER PLUS W.
- PAVEMENT RESTORATION IS 12 INCHES MINIMUM BEYOND THE EDGE OF THE TRENCH ON LONGITUDINAL OPEN CUTS, OR 25 FEET MINIMUM BEYOND THE TRENCH CENTERLINE ON PERPENDICULAR OPEN CUT, OR AS MENTIONED ON COA APPROVED PLANS.

TRENCH BEDDING & BACKFILL DETAIL
DUCTILE IRON PIPE (DIP) - TYPE 4

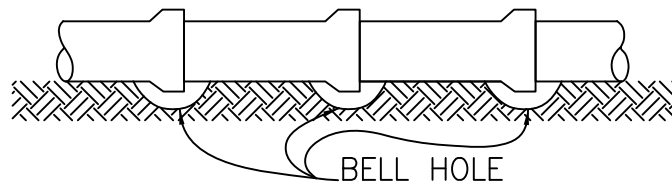
DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021
REVISION DATE

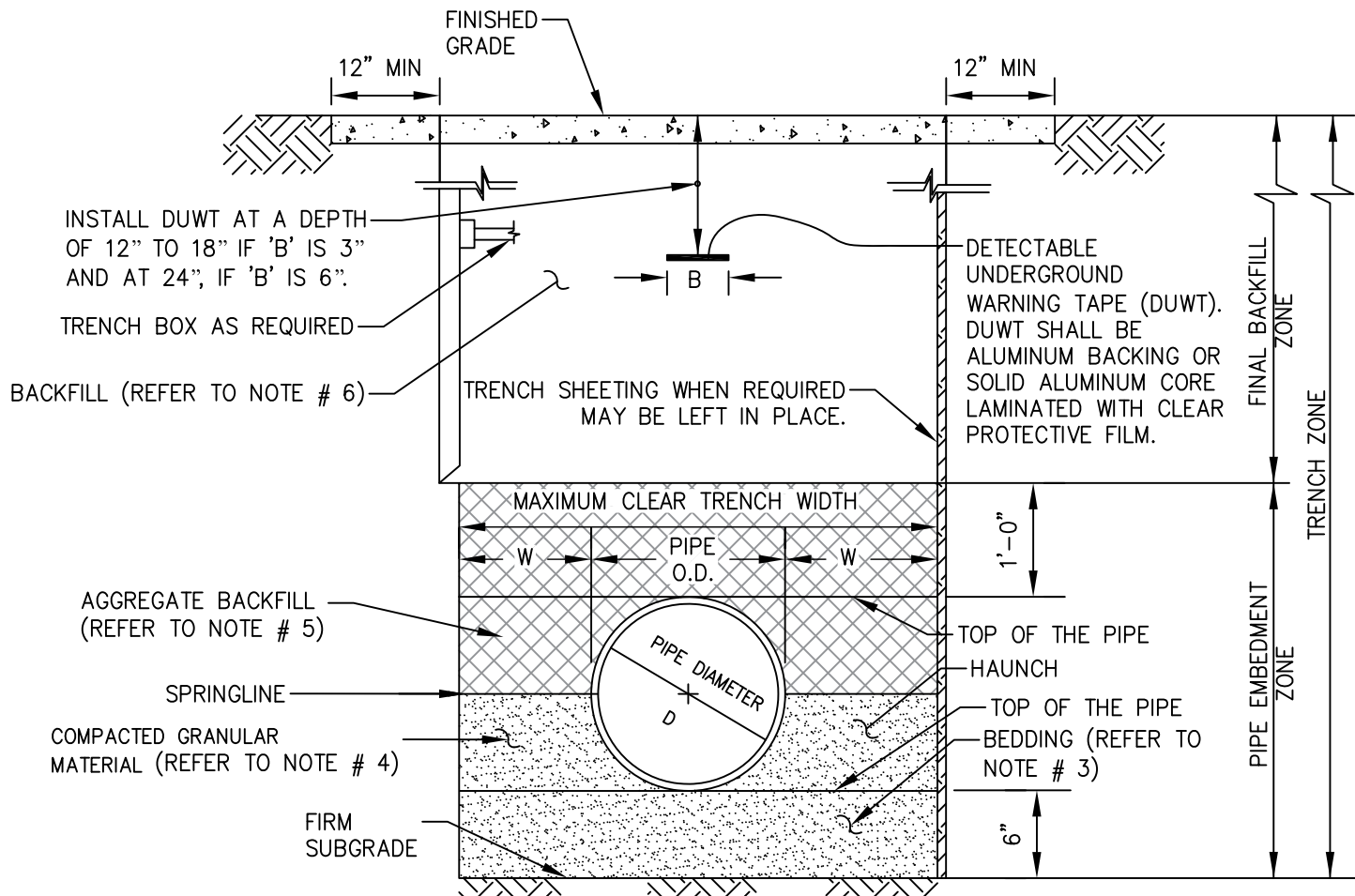
CSTB-2

PAGE 37

W = 1'-6" OUTSIDE THE PIPE BELL
FOR PIPE DIAMETER GREATER THAN 18"



BELL HOLES SHALL BE EXCAVATED SO THAT THE PIPE IS SUPPORTED BY THE BARREL AND NOT BY THE BELLS.



NOT TO SCALE

- THE TRENCH WIDTH SHOULD NOT EXCEED THE PIPE OUTSIDE DIAMETER PLUS W.
- PAVEMENT RESTORATION IS 12 INCHES MINIMUM BEYOND THE EDGE OF THE TRENCH ON LONGITUDINAL OPEN CUTS, OR 25 FEET MINIMUM BEYOND THE TRENCH CENTERLINE ON PERPENDICULAR OPEN CUT, OR AS MENTIONED ON COA APPROVED PLANS.

TRENCH BEDDING & BACKFILL DETAIL

TYPE 5 DUCTILE IRON PIPE (DIP)

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021	
REVISION	DATE

CSTB-2A

PAGE 38

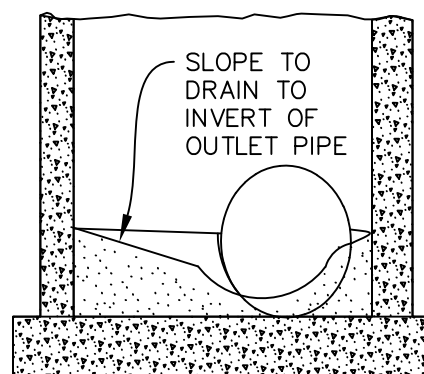
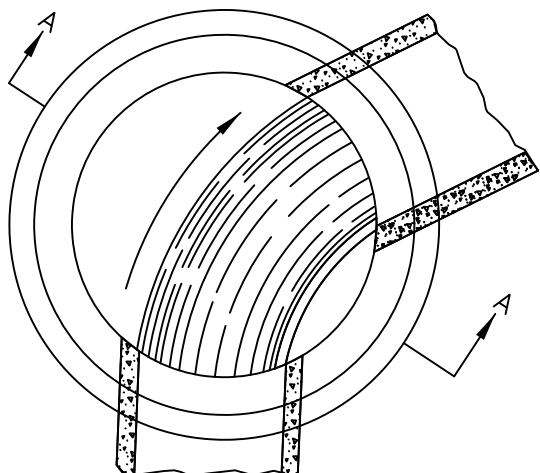
NOTE:

1. DUCTILE IRON PIPE (DIP) SHALL BE INSTALLED PER THE REQUIREMENTS OF ANSI/AWWA C150/A21.50 AND ANSI/AWWA C600, AS MODIFIED IN THIS DETAIL.
2. MINIMUM COVER FOR ALL H-25 LOADING APPLICATIONS SHALL BE 3'-6". MINIMUM COVER IS MEASURED FROM THE TOP OF PIPE TO THE TOP OF A RIGID PAVEMENT OR BOTTOM OF FLEXIBLE/ASPHALT PAVEMENT SECTIONS.
3. BEDDING MATERIAL SHALL BE SAND, GRAVEL, OR CRUSHED STONE CONFORMING TO THE REQUIREMENTS OF ANSI/AWWA C150/A21.50 AND ANSI/AWWA C600 OR VDOT AGGREGATE #8 OR CRUSHER RUN AGGREGATE #25 OR #26 CONFORMING TO THE REQUIREMENTS OF SECTION 205 OF VDOT ROAD AND BRIDGE SPECIFICATIONS TO A DEPTH OF 1/8 PIPE DIAMETER, D, OR 6" MINIMUM. WORK MATERIAL UNDER PIPE TO PROVIDE HAUNCH SUPPORT. WHEN STANDING WATER IS IN PIPE FOUNDATION AREA, #57 STONE CAN BE USED AS A BACKFILL IN THE SUBFOUNDATION WITH THE CONDITION THAT #57 STONE SHALL BE CAPPED WITH A MINIMUM 4" CRUSHER RUN PRIOR TO PLACEMENT OF A PIPE (COMPACTION TESTING ON #57 STONE IS NOT REQUIRED; SEAT STONE IN TRENCH).
4. PIPE BEDDED TO ITS CENTERLINE IN COMPACTED GRANULAR MATERIAL CONFORMING TO THE REQUIREMENTS OF ANSI/AWWA C150/A21.50 AND ANSI/AWWA C600 WITH 6" MINIMUM UNDER PIPE OR VDOT AGGREGATE #8 OR CRUSHER RUN AGGREGATE #26 AND #27 CONFORMING TO THE REQUIREMENTS OF SECTION 205 OF VDOT ROAD AND BRIDGE SPECIFICATIONS. WORK MATERIAL UNDER PIPE TO PROVIDE HAUNCH SUPPORT. WHEN STANDING WATER IS IN PIPE FOUNDATION AREA, #57 STONE CAN BE USED AS A BACKFILL IN THE SUBFOUNDATION WITH THE CONDITION THAT #57 STONE SHALL BE CAPPED WITH A MINIMUM 4" CRUSHER RUN PRIOR TO PLACEMENT OF A PIPE (COMPACTION TESTING ON #57 STONE IS NOT REQUIRED; SEAT STONE IN TRENCH).
5. AGGREGATE BACKFILL MATERIAL SHALL BE SAND, GRAVEL, OR CRUSHED STONE CONFORMING TO THE REQUIREMENTS OF ANSI/AWWA C150/A21.50 AND ANSI/AWWA C600 COMPACTED TO 1 FOOT ABOVE TOP OF PIPE (APPROXIMATELY 80% STANDARD PROCTOR, AASHTO T-99) OR VDOT CLASS I BACKFILL MATERIAL SHALL BE CRUSHER RUN #26 AND #27, AGGREGATE BASE 21-A, OR 21-B WITH DRAINAGE, FLOWABLE FILL, OR CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE #26 AND #27 - FROM BEDDING TO 1 FOOT ABOVE TOP OF PIPE. THE BACKFILL SHALL BE INSTALLED IN LIFTS AND COMPACTED PER ANSI/AWWA C150/A21.50 AND ANSI/AWWA C600.
6. EXCAVATED MATERIAL BACKFILLED IN 6" LAYERS TO 95% COMPACTION. SELECT MATERIAL, WHERE CALLED FOR, MAY BE USED.
7. BACKFILL UNDER PAVED ROAD TO BE SELECT MATERIAL VDOT 21A.
8. SHEETING LEFT IN PLACE SHALL BE EITHER STEEL OF PRESSURE TREATED WOOD.

TRENCH BEDDING & BACKFILL DETAIL
NOTES FOR DUCTILE IRON PIPE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

06/21/2021
REVISION DATE
CSTB-2B
PAGE 39



SECTION A - A

TREATMENT IN PRECAST MANHOLES

NOTES:

1. SHAPING OF MANHOLE IN ACCORDANCE WITH THIS DRAWING IS TO APPLY TO THOSE STRUCTURES SPECIFIED ON PLANS.
2. MANHOLE IS TO BE FORMED AND CONSTRUCTED IN ACCORDANCE WITH APPLICABLE STANDARD OR SPECIAL DRAWING. THE INVERT SHAPING AS DETAILED HEREON IS TO CONSIST OF A PORTLAND CEMENT CONCRETE MIX CONFORMING TO VDOT CLASS A3. THE SURFACE SHALL BE LEFT SMOOTH BY MEANS OF HAND TROWELLING. NONE OF THE COARSE AGGREGATE SHALL REMAIN EXPOSED
3. INVERT TO BE PAVED TO THE SHAPE OF THE PIPE AND TO THE SPRING LINE EXCEPT WHERE INLET AND OUTLET PIPE MAKE AN ANGLE WITH EACH OTHER IN WHICH CASE PAVING SHALL BE TO THE CROWN OF THE OUTLET PIPE. THEN FROM THE SPRING LINE OR THE CROWN, WHICHEVER IS THE CASE, THE PAVING IS TO BE EXTENDED UPWARD AT A 45° ANGLE TO MEET THE STRUCTURE WALL.
4. DETAILS OF INVERT SHAPING AS SHOWN HEREON ARE FOR EXAMPLE PURPOSES ONLY. EACH MANHOLE IS TO BE SHAPED INDIVIDUALLY TO BEST FIT THE PARTICULAR INLET AND OUTLET CONFIGURATION AND FLOW LINES.

MANHOLE SHAPING

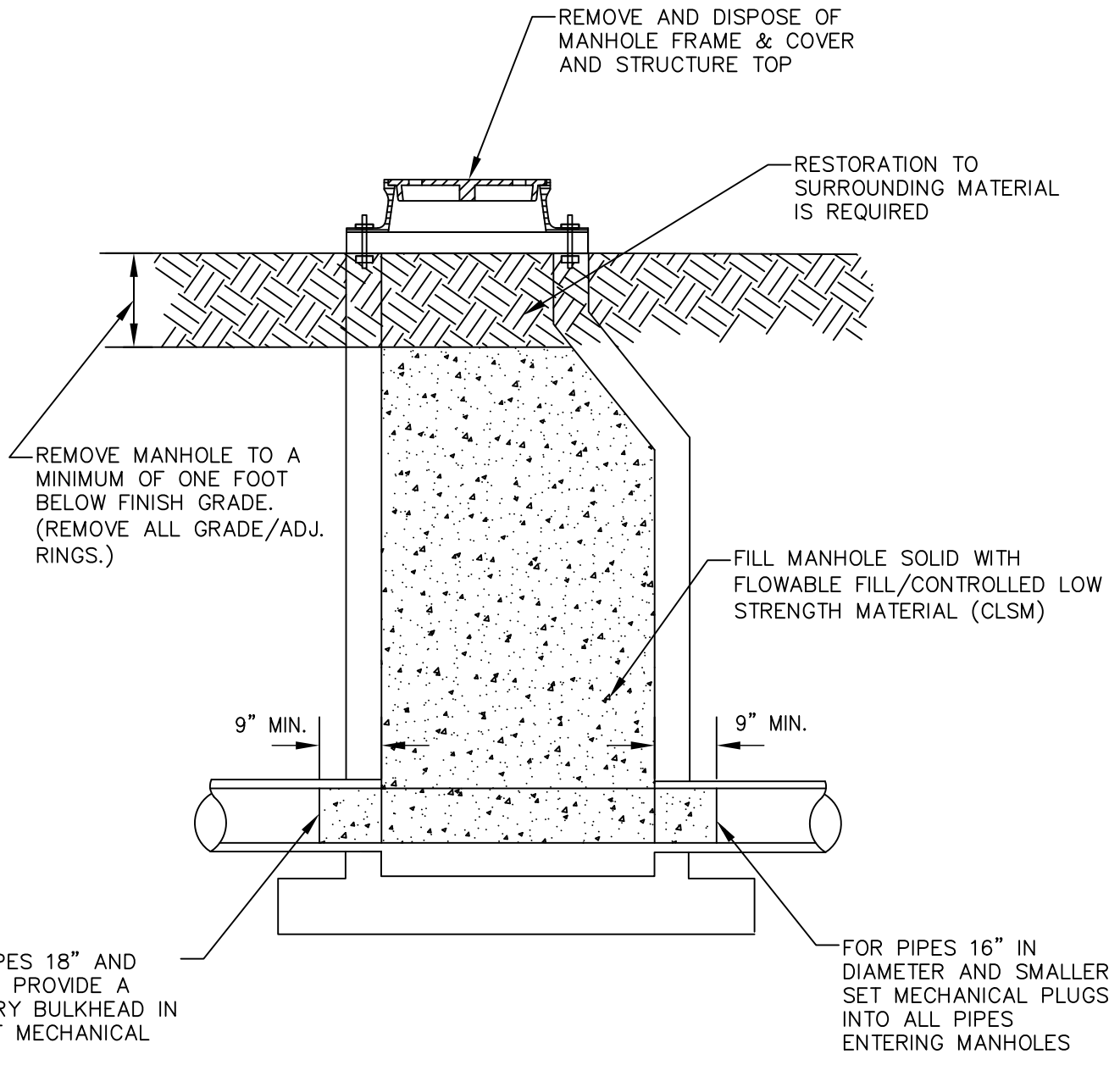
06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSIS-2

PAGE 40



NOTE:
VDOT A3 CONCRETE SHALL BE USED FOR THE CONCRETE MATERIAL.

MANHOLE ABANDONMENT

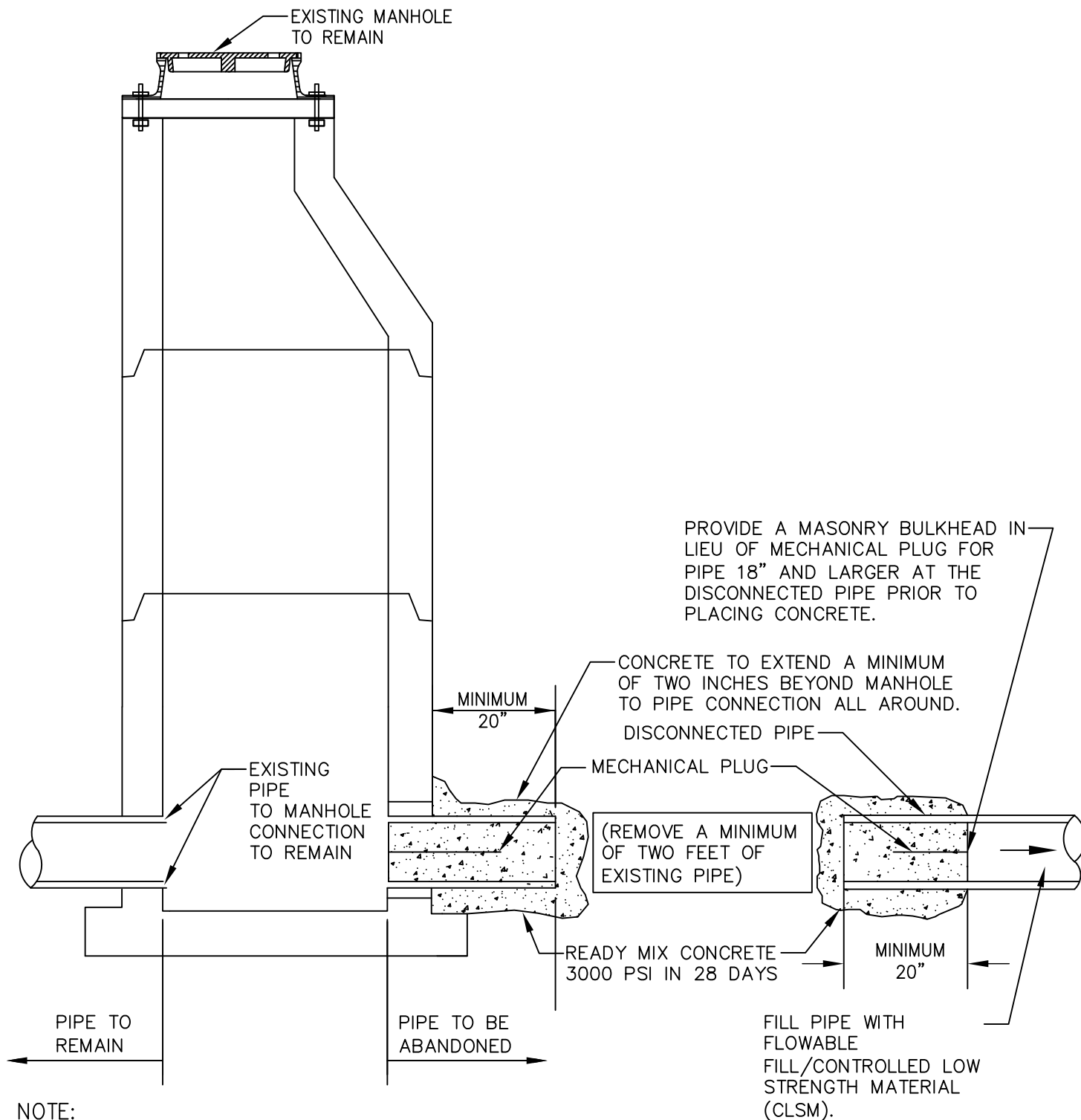
06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSMA-1

PAGE 41



NOTE:

1. VDOT A3 CONCRETE SHALL BE USED FOR THE CONCRETE MATERIAL.
2. WHEN THE PIPE IS TO BE ABANDONED FROM THE STRUCTURE, THE WALL SHALL BE FLUSH WITH CONCRETE.
3. CONTROLLED LOW STRENGTH MATERIAL (CLSM) IS A SELF-COMPACTED, CEMENTITIOUS MATERIAL USED TO FILL ABANDONED SEWERS. (ASTM D-5971, ASTM D-6103, ASTM D-6023, ASTM D-4832)

PIPE ABANDONMENT

06/21/2021

REVISION DATE

DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES
ALEXANDRIA, VIRGINIA

CSPA-1

PAGE 42